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PRESIDENTIAL ADDRESS ON SOME QUESTIONS IN SEASIDE CLIMATOLOGY.*

Ω δῖος αἰθὴρ καὶ ταχύπτεροι πνοαί,
ποταμῶν τε πηγαί, ποντίων τε κυμάτων
ἀνήριθμον γέλασμα, παμμῆτόρ τε γῆ,
καὶ τὸν πανόπτην κύκλον ἡλίου καλῶ.

BY ALFRED F. STREET, M.A., M.D., B.C., D.P.H.CANTAB.
(WESTGATE-ON-SEA).

GENTLEMEN,—When I realised that one of the duties of the honourable office to which you have done me the honour of electing me would be the production of an address, I confess that my first feelings were those of despair.

However, I took counsel with Dr. Sunderland, than whom no one knows better the needs of this Society, and his suggestion was that I should attempt to deal with some topic relating to the sea.

For further inspiration I consulted an eminent Fellow of the Society, and his reply was as follows: "I should con-

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sider the factors of a bracing climate, because yours is about the most pronounced specimen of the sort that I know."

What follows will therefore concern certain questions which have long and deeply interested me with regard to the air of the locality in which I have the good fortune to live; a locality the air of which Dr. Ord says is "singularly pure and invigorating," and which Dr. Burney Yeo tells us has "important tonic properties," a locality of which Dr. Ewart wrote that it has a soil drier than almost any other in England, which is the last to be visited by the storms which come to us from the Atlantic, which, owing to the absorbent qualities of its soil, has its land wind more than usually free from moisture, which enjoys almost the full advantage of the warmth of the Gulf Stream, and in this respect excels the more northerly east coast watering places of Great Britain, and against which his only indictment is that it is "hyperventilated," for it is on record that the average number of calm days in the year is only thirty-eight.

That close observer, the late Sir James Paget, said to me nearly twenty years ago that his experience was that many scrofulous patients would get well there when they would not get well elsewhere, though he frankly admitted that he could not say what was the special property of the air. As to its effects he entertained no doubt, and though his claim may not be universally admitted, that point may be waived.

When, eight years ago this Society was founded, I hoped to hear the answer to this problem, but it has not come.

Can we, in the light of the fuller knowledge of to-day, point to facts which may to some extent explain the essential causes of differences of climate, such as do not find full explanation by the barometer, the thermometer, and other ordinary meteorological instruments? For it has been very truly said that just as no two faces are alike, so there are no two places having quite the same climate.

The factors of climate are said to be reducible to: (1) Distance from the equator; (2) distance from the sea; (3) height above the sea; (4) direction of most prevalent winds.

Now this is but a very partial statement of the truth; for instance, it takes no cognisance of so potent a factor as the Gulf Stream, to which we in these islands are indebted for the advantage that though London has the latitude of Labrador, it has a far higher mean winter temperature.

Nor does the statement that "weather spells climate" carry the whole truth, for there are many other factors in climate, at any rate in local climate, which after all is what chiefly concerns our patients.

Besides such local influences as the Gulf Stream there are the configuration and inclination of the land, the character as to porosity or drainage of the soil, the presence or absence of vegetation, of cultivation, of plantations or of forests, the degree of protection afforded by trees, by mountain ranges, or merely by higher ground in the vicinity, the density of population, the neighbourhood of manufactories and their nature, and so on. It would be more true to say that climate depends upon conditions of soil, air, temperature, moisture, solar radiation in all its many forms, and possibly on electrical and other even less known conditions.

Can we make any notable advance towards that clearer insight which enables us to replace empirical by rational knowledge?

In considering the claims of any locality with reference to the cure of any disease, the first question which presents itself is, to what extent does the disease in question prevail among those born and bred in the locality? If we take scrofula as an example, it must be conceded that the north-east corner of Kent, for instance, comes out exceedingly well, for those who practice there find almost no home-grown tuberculosis, and imported cases commonly do well.

In the face of the prolonged experience of many careful observers extending over many years, it would surely be unreasonable to deny the claims of various localities, to be credited with various cures, and the further question arises as to what factor or combination of factors a particular locality owes its influence? We all know that in the case

of a spa the popular answer is "to the waters," and in the case of most seaside places "to the air."

When a visitor comes to the seaside it matters not whether he feels better or worse; the cause, so far as he is concerned, is "the air." Perhaps he calls it "the strong air." He does not know what he means by the epithet "strong," but it has the advantage of being capable of conveying either praise or blame. Indeed one constantly finds it considered capable of producing diametrically opposite effects in different people. One has diarrhœa—the cause is not unripe plums but "the strong air;" another is constipated—he forgets all about his personal negligences and again it is "the strong air"; and so on. But here we have no concern with the *vox populi*, we seek for facts and for legitimate deductions from them, and finally, if possible, for explanations of them.

We cannot credit the air alone with antitubercular virtue, we must give due weight to sunshine, to dryness of soil, and to many other climatic factors. Relative humidity is a very thorny subject not now to be especially considered, but its importance may be judged from the calculation that every pound of water condensed from vapour liberates heat sufficient to melt five pounds of cast iron.

Yet it does appear that there is in the air of certain localities a quality which cannot be expressed by chemical symbols, and yet of which some of us are conscious. I cannot better express it than by the term "briskness," for it is not coldness, neither the coldness measured by the thermometer, nor the other coldness so especially appreciated by the skin. It is felt by night as well as by day, and is therefore not wholly dependent upon sunshine. It is most pronounced during the prevalence of winds which are not westerly, and is therefore fairly attributable to the sea over which every other wind in this locality has passed immediately or nearly so. It has been truly said that "each health resort is distinguished from all others by meteorological conditions of its own," and the more closely we investigate these the more differences do we find beyond the invariable differences of latitude and longitude, in fact, Professor Buchan declares that "we

are only on the threshold of a rational enquiry into the true character of seaside climates." We are told by a writer in the last number of our Journal that "few seaside places are really bracing," but he will not carry that proposition *nemine contradicente.*

Let us now consider how geographical position affects the physiological effects of this air. Is there, for example, a greater percentage of ozone?

Now ozone has long occupied a commanding position in this connection, but one of the objects of this address is to submit to you that ozone is, like many other prominent folk, an impostor.

There is no question of denying its existence, or of doubting its constitution, nor its willingness to part with its odd atom in the good cause of oxidation, but is there convincing evidence that it is produced in Nature except during thunderstorms, as was known to Homer by what he calls the smell of the thunderbolt? In a recent article Professor Abbe asserts that there is no such evidence, and Professor Miller wrote as follows: "The existence of traces of ozone in the atmosphere, probable though it is, cannot be said to have been unequivocally proved." Yet its presence should be determinable beyond doubt, since Hartley Chappuis and Schöne agree in saying that it has a definite absorption spectrum, and various observers have asserted that it is formed in Nature in various ways. Thus M. Peyrou found that papers moistened with a solution of starch and iodide of potassium, and suspended over a patch of growing lucerne, acquired a deeper colouration than similar papers similarly suspended over a neighbouring plot of ground free of vegetation.

Now this test was hopelessly discredited years ago, for it can easily be proved that such papers react to peroxide of hydrogen, and to nitrous acid, and to other bodies often present in the atmosphere, and that, unless the iodide of potassium has been freed from iodate, even the carbonic anhydride of the air in presence of water will discolour the paper; and there is the further difficulty that the so-called

iodide of starch is said to be volatile, especially in presence of much moisture, and, at any rate, ozonoscopes are found to fade on continued exposure.

The fact is that no satisfactory test for ozone in air has yet established its position.

It is asserted that ozone is formed when electricity is generated by the friction of waves beating on rocks, and it has even been asserted that it is formed during the combustion of carbon in air. There are many other tests for it, such as red litmus paper moistened with a solution of iodide of potassium, paper moistened with a solution of thallous hydroxide, which it turns brown (probably peroxide of hydrogen does the same), or with one of manganous chloride. In the laboratory, chromic acid will decompose peroxide of hydrogen and not ozone, but this test has not been applied to the atmosphere.

Again, ozone may be distinguished from both peroxide of hydrogen and nitrous acid by the red colour which, according to Erlwein and Weyl, it alone gives with metaphenylene diamine in the presence of an alkali, but this test has not been applied to the case of atmospheric air. From spectroscopic observations Schöne concludes that there is no more than a probability of its presence in the atmosphere, and Professor Ramsay, a great authority on subjects connected with the atmosphere, states in a recent work as follows: "The occurrence of ozone in the air is still a matter of dispute."

Yet most books on climatology not only confidently assert its presence, but distinguish between places and seasons in which it is more or less prevalent. Thus we are told that there is more in mountain air than in sea air, and *vice versâ*, and more in the spring than at other seasons, and more in forests than over plains, and one-third more in air from over the sea than in that from over the land, and by Würster that it is formed by sunlight upon clouds, and by silent atmospheric electrical discharges.

It is true that ozone produced by electricity in the laboratory is destroyed by heat, but ozone so formed is part of

an unstable mixture which, having been formed in excess of the equilibrium value for ordinary temperatures, is undergoing spontaneous decomposition, and this, like other chemical changes, is accelerated by raising the temperature.

Guntz believes that he has shown that the ozone formed by lightning is formed not by the electricity but by the heat which results from the electrical discharge; and Professor Nernst, at the recent German Congress of Applied Chemistry, has argued that, owing to the enormously high temperature and great gravitational pressure, the oxygen in the sun is probably wholly in the condition of ozone; and this view is borne out by the fact that, being an endothermic body, it becomes more stable the higher the temperature to which it is raised.

So ready is ozone to part with its loosely attached atom, and so universal is the presence of oxidisable matter in the localities where ozone is said to be produced, that it is hard to understand how sufficient can escape destruction to enable us to detect its presence, except perhaps by means of the spectroscope, for it is said that it is never present in greater quantity than one part in 700,000. It would indeed relieve us of many of our sanitary difficulties if it were produced by Nature in large quantity.

Apparatus for the production of ozonised air in the sick-room is advertised by instrument makers, but apparently the demand for it, and perhaps also the utility of it, is not very great, for, according to Dr. B. W. Richardson, even small percentages of ozone in inspired air cause inflammation of the respiratory tract, and it is possibly for this reason that it does not seem to have been considered advisable to add it to the oxygen which is manufactured for use in cases of pneumonia. Oudin asserts that the inhalation of ozonised air causes a rapid increase in the hæmoglobin of the blood, though he does not indicate how this is effected. In places where the difficulty of dealing with dead seaweed is insuperable, it is locally said to exhale ozone, and I remember that, on visiting a resort where the retreating tide exposed many

acres of sewage-polluted mud, I was asked to believe that the mud generated ozone.

With regard to the so-called ozone of pine-forests, Schönbein and others considered that ozone was formed by the slow oxidation of turpentine, but Kingzett's experiments (1874-1880) show that ozone is not produced in this operation, but that peroxide of hydrogen results as a secondary product by the action of water upon a peroxidised derivative of turpentine.

In connection with the claims of ozone there are those of peroxide of hydrogen to be considered, but we know scarcely more than that chemists have been aware of its existence in atmospheric air since it was discovered by Schönbein in 1840. He found that it was formed together with ozone during all the slow oxidation processes in course of which the latter is formed, and also during its electrical production. It has no smell. It has been found by Clermont in most unexpected places—in vines, in lettuces, and even in tobacco-juice.

There are special chemical reasons for believing that it is present in the atmosphere; amongst others it may be mentioned that Fenton has shown that tartaric acid in the presence of iron gives, when exposed to air and sunshine, the characteristic reactions of dioxymaleic acid, and he finds that sunshine and air may, in this reaction, be replaced by peroxide of hydrogen, but not by ozone nor by nitrous acid, so that he very plausibly suggests that peroxide of hydrogen is formed by the action of the sun and air.

But books on climatology disregard it, and no one seems to have concerned himself about its influence whether climatological or physiological, though Meissner in 1863 claimed to have detected its constant presence in atmospheric air, and Struve found it in water and in snow. There is not much probability that it will succeed to the reputation which ozone does not deserve, though such influence as it has is no doubt good, because like ozone it is always ready to hand on its extra atom of oxygen.

It has been supposed that the chloride of sodium diffused

by spray in seaside air has a tonic effect, but it seems hardly reasonable to think that a very minute quantity of a chemically inert body should have important effects on the body which is permeated by fluids which contain it in plenty. Iodine and bromine have also been brought forward, but in what compounds and in what quantities we are not told, and, considering the usual medicinal doses of their compounds, the quantities possibly present in the air must be quite unimportant.

A consideration of what is known of helium, neon, argon, krypton, and xenon shows them to be extraordinarily inert, for they are said to form no known compound, and therefore to have no polarity. One is inclined to wonder if there is not here an exception to what is said to be the only undisputed maxim in philosophy, namely, "Nihil natura agit frustra," but in the hands of Professors Liveing and Dewar the spectroscope has shown that in the case of krypton, at any rate, the maxim still holds good, for krypton is probably responsible for one of the green rays of the aurora borealis.

The same observers tell us that in the spectrum of the gas which separates from atmospheric air solidified by liquid hydrogen, and which has so far proved to be incondensible, there are a vast number of rays most brilliant at the violet end, and which belong to elements hitherto unidentified. This spectrum suggests the presence of more than one unknown substance in the most volatile portion of the atmosphere. Can there be here any gas of climatological or physiological importance? Is there a yet undiscovered element, minute as it must be in proportion, but potent in action?

When we remember the wonderful properties of the most minute fragment of a compound of radium, or the powerful physiological action of very small fractions of a grain of hyoscine or of adrenalin, it is not impossible to think that an element or compound as yet unknown may be responsible for important therapeutic effects.

There remains to be mentioned hydrogen, which is undoubtedly present in our atmosphere, but for every gas

there is an altitude at which as many molecules diffuse outward as inward in unit time, and recent physical deductions lead to the conclusion that such hydrogen as the earth exhales, so to speak, into its atmosphere from the pores of certain minerals leaves the extreme confines of our atmosphere on its way through interplanetary space to join the atmosphere of the sun, the gravitational attraction of the earth's mass being overcome by that of the sun; but even if it stayed with us it is not clear what physiological effects it would have except as a diluent of oxygen.

Is there a greater percentage of oxygen in sea air than in land air?

I know of no evidence that there is, though Dr. Angus Smith found ·92 per cent. more than the average in the air of the Western Highlands, and although volume for volume there is of course more oxygen in sea air than in mountain air, still if there be any such preponderance, however small, it would be likely to exert a stimulating effect, just as we know that a small decrease of the normal proportion of oxygen is depressing, and it is certain that there are variations in the proportion of carbonic anhydride. Thus there is less in exposed than in sheltered places, and less in air from over the sea than in that from over land, more by night than by day, and more in summer and winter than in spring and autumn. Just as it is not possible to predicate the therapeutic effects of a given water from a consideration of a laboratory analysis of it, so it is not at present possible to explain the difference in physiological effect between the apparently similar air of different places.

At one of the earliest meetings of this Society, Dr. Snow very rightly told us that it was not so much to the composition of a water that we must look as to the results upon the patient that experience had shown could be obtained. We must not neglect the teachings of experience only because we cannot explain them, and this applies to air quite as much as to water, and we have to remember that the best chemical analysis would be eluded by an unrecognised element, and

it is only recently that the very existence of several normal constituents of the atmosphere has been established.

Helium is an apparently inert element, but is it certain that its presence and that of argon in the water of one of the Bath springs has no influence on the therapeutic effects of that water? Can it be certain that it is there merely in solution? If not, it may in combination be capable of results as astonishing as those of some compounds of the typically inert nitrogen.

Is it lawful to surmise that some as yet unknown element gives its peculiar character to the air of some localities, or shall we find our explanation in the new and mysterious property introduced to us by Becquerel as radio-activity?

It is true that hitherto the chief sources of radium and polonium, the best known of the radio-active bodies, are minerals such as pitch-blende and chalcolite and not the ocean, but Wilson has proved the existence of a radio-active substance in filtered rain-water and in snow and hail, especially during a thunderstorm, and it is not destroyed by heating the containing vessel to dull redness. Professor J. J. Thompson has extracted at least two radio-active gases of great density from many different deep well waters, and has shown that their radio-activity is different in kind from that of radium, in that they render radio-active a negatively electrified surface and not an *un*-electrified one.

Strutt finds radio-activity to be widely diffused, and that there is some in most metals, and Sir Oliver Lodge surmises that radio-active emanations (the so-called a-rays), which are believed to consist of actual atoms of matter, may proceed from many substances without our being yet aware of their existence. Messrs. Rutherford and Allen have found that a negatively charged body exposed in the air becomes radio-active, and they conclude that therefore there is some radio-active substance in the atmosphere.

Sea water has not, it seems, hitherto been subjected to examination as to its radio-active properties, but it is reasonable to suppose that in this respect it is more likely to resemble well water than surface water. Before the discovery of radio-

activity, Dr. Julius Hann wrote thus: "There can hardly be any doubt that there are still other modifications in the composition of the atmosphere which have some influence on the human organism, but which have not yet received any attention."

May we expect any help from a consideration of variations in the electrical or magnetic conditions of different localities, which Dr. Solly considers to be very important?

The mysterious and elusive character of electricity and magnetism tempts us to ascribe to them any characteristics which are apparently not otherwise explicable, just as the ancients invoked the aid of magic, and it may be that we shall find in them the answer to this problem, for undoubtedly some people are especially sensitive to abnormal atmospheric electrical conditions, and it has been experimentally shown that strawberries ripen sooner and in greater numbers when grown under the influence of an electrical field. A beneficial effect has been observed in the case of plants grown under one of the poles of a Wimshurst machine, and this cannot be ascribed to ozone, which is formed chiefly at the positive pole, whereas the plants in question did best near the negative pole. Messrs. Elster and Geitel have arrived at the conclusion that free ions exist in the atmosphere, and if so they may be of physiological importance. Now we are told that the average amount of electrical force is least when the wind comes from a point midway between N. and N.N.W.—that is to say, from a point midway between the true and the magnetic N. poles—and yet this is the wind which seems to me to deserve more than any other the epithets brisk, bracing, stimulating. But Professor Tait writes that "our ignorance of the source of atmospheric electricity is singularly complete."

Professor Buchan tells us that the fundamental element of climatology is the temperature of the air, and it is calculated that only 50 per cent. of the total solar radiation due, so to speak, on a given area at the sea-level ever reaches that area. Even when the sun is at the zenith the amount which arrives is very much less than 100 per cent., and by no means all

of this is heat, especially as our atmospheric envelope is more transparent to the rays of shorter than to those of longer wave-length. Now the temperature of this air is one of the few things we need not argue about, for it has been observed daily, steadily and systematically, for some three and twenty years by the indefatigable observers of the Royal Meteorological Society, and the maxima, the minima, the average and many other data, are on record. Without quoting rows of figures, the facts are that the average daily range is moderate (namely, $11{\cdot}3^\circ$ F.), as that of every seaside place must be owing to the moderating influence of the sea, and that the average temperature is that of London, partly no doubt owing to the fact that the sunshine average is more than 20 per cent. more at the former than at the latter.

Owing to the influence of the Gulf Stream aided by the preponderating prevalence of south-west wind, the winter isothermal lines of Great Britain lie nearly north and south instead of east and west. An isothermal line of January slants across England from Dover to North Wales, and passes thence along the west coast of Scotland.

The greater frequency of barometric variations near the sea may tend towards the attainment of that perfection of organic life which is said to depend on the alternations of excitement and repose.

Let it be granted then, and granted I think it must be, that the atmosphere of some localities has special properties, and let it be admitted that we cannot at present express these properties in terms of any known element or force, then there arise two questions :—

Firstly, under what circumstances are these properties therapeutically valuable ?

Secondly, can we in any way preserve, intensify, or diffuse these properties ?

In attempting to answer the first of these questions a sentence of de Chaumont seems apposite, namely, that "To the healthy meteorological conditions are of little moment apart from personal comfort." On the other hand, what

patients would derive benefit from such a climate, and for what patients would it be undesirable?

When we try to work out the answer to these questions we find ourselves in the position of the medical man who is called upon to prescribe a diet not for a disease but for a patient. It is comparatively easy to prescribe for an abstract disease—that is what the text-books do—but how difficult for a concrete patient, and one, too, who probably has strong and inconvenient leanings and antipathies, or idiosyncrasies, such, for example, as an unusual sensibility to diminished atmospheric pressure, similar to the case of cats, which according to Dr. Burney Yeo cannot be acclimatised in certain localities of high elevation. The determination of principles for the selection of climates is one of the most vitally important services which this Society can render to our profession, for it is impossible to trust most of the hard and fast rules which are offered for our guidance.

Is it not rather common to hear a patient say, "I was sent to such and such a place, but I hated it all the time I was there"; or, "I went and I did all the doctor told me to do, and I came away worse than when I went." If not an *opprobrium medicinæ*, this is at any rate an *opprobrium medici;* and when we have taken off a large discount for the exceptionally foolish and the merely mistaken, is there not an appreciable residue? The public, of course, label places with the names of certain diseases just as they label consultants, and there is a real difficulty before us when we try to avoid the same pitfall.

May we not rightly argue that, owing perhaps to the strain and stress of modern existence and the constantly increasing proportion of town-dwellers, there is more need for and advantage to be gained from a climate which is stimulant than from one which is sedative, from strychnine rather than from bromide of potassium?

Dr. Burney Yeo maintains that sea air makes less demands upon the organism than does mountain air. A late President of the American Climatological Association describes sea air generally as a "sedative tonic," and he sums up as

follows: "Considerations so many and so difficult enter into the fitting of an individual case to the particular climate that it would be a futile effort to prescribe special climates for special diseases."

Nevertheless we may say, as Dr. Leonard Williams has recently very forcibly said, that in the case of certain diseases certain climatic combinations are to be avoided. There are constitutions in which a stimulant atmosphere produces a feeling of general discomfort, and there are people who have idiosyncrasies with respect to climate just as others have with respect to drugs.

Now just as those who make the fewest mistakes in the prescribing of diet are those who consider the likes and dislikes, and who know the ordinary mode of life of a patient, so shall we most successfully give advice in respect of climates if we carefully consider not only the name of the patient's disease, but his climatological likes and dislikes. The man of open windows is likely to thrive best in stimulant air, and the man who is sensitive to draughts may be better suited by a more sedative climate; for in some persons the automatic control of the vaso-motor system is clearly either undeveloped or too slow. Nor can we afford to lose sight of the great importance of aspect. How often it happens, especially in the spring, that there is one climate on the north side of a wall, and another on the south side.

There is no need to insist on the need of avoiding dry cold wind in cases where damaged kidneys are able to do only part of their duty, or for pulmonary cases enfeebled by prolonged suppuration, nor does anyone in England need to be reminded that one cannot in England reckon on summer weather in summer time, nor indeed upon winter weather in winter time. Most children are the better for a stimulant climate, and of the people best suited by a sedative climate a large proportion are aged.

My second question is soon answered. "Man," it has been truly said, "cannot change the weather by any device yet suggested, not even by American methods of rain production, yet he does affect climate by removing trees (for

vegetation increases the absolute humidity of the air, though not the actual rainfall), and by drying the soil by works of drainage, or by supplying it with water, as by means of the Assouan dam, and by the cultivation of previously barren spots.

We can preserve the life-giving properties of our air by cultivating the highest ideals in sanitary matters. It is of little use to live at the seaside with shut windows, and in air used up by overcrowding, and fouled by dust and by pestilential sewers and filthy dust-bins, and it is universally admitted, or should be so, that a dry subsoil and clean underground air are essential to high sanitary excellence. Parasitic microbes grow most readily in warm moist places, and it has been calculated that in the course of a single day a man inhales 10,000 litres of air, so that determinations of the number of living micro-organisms present in the atmosphere at the ground level at once assume great importance.

Now it has been shown, on the one hand, that an adult in Manchester inhales in the course of ten hours thirty-seven millions of microbes, and that in London there are present from 80,000 to 210,000 solid particles in each cubic centimetre of air, and, on the other hand, that in the air of the Western Highlands the corresponding number is only sixteen.

In these respects a great responsibility rests upon our profession, the responsibility of helping to educate and influence not only our patients as such, but all who hold office in the public bodies by which we are more or less misgoverned.

Finally, I would ask you to assent to this proposition. The places in our islands which enjoy most often a pure and stimulating atmosphere are those the air of which comes most often from over the sea. The more directly it comes from the sea and the longer it has been away from land the more pure it is. Its stimulating properties depend partly upon its humidity, partly upon its temperature, and partly upon factors not yet thoroughly understood.

"I speak as unto wise men, judge ye what I say."

A SCHEME FOR THE COMPARISON OF CLIMATES.

BY W. F. TYLER, F.R.MET. SOC.

FOREWORD.

THE following paper contains what is believed to be the first attempt towards establishing a climatic scale. The writer has experienced a curious difficulty in getting his idea on the subject understood, and he is forced to the conclusion that this, in part at all events, must be owing to his want of clearness of explanation. But it is probably also partly due to the difficulty which many people have in grasping an entirely new idea which conflicts, perhaps, with established notions. The idea of equal differences of sensations of various kinds, which is the foundation of the proposed scheme, seems to offer similar difficulties to some as the principle of the calculus or the idea of a fourth dimension offers to others. But in appealing to medical men for an appreciation of his idea, the writer is confident that, at all events, the importance of the object aimed at—the formation of a climatic scale—will be fully realised.

Owing to the fact that the paper was originally written for meteorologists and not for the medical profession, the aspect of the subject, which specially concerns the latter, has not been emphasised, and it seems well to here say something about it.

The writer is unacquainted with medical literature on the subject of climate, and cannot be certain what that term connotes to the average medical man. But his impression is that the word climate is generally used to indicate, in respect to a particular locality, what is the effect of local conditions generally on persons of varying temperaments.

Now what are these local conditions which are supposed to be the factors in the formation of climate? Are they not chiefly temperature, soil, prevailing winds, aspect, rainfall, humidity, altitude and sunshine? And how are the effects of varying combinations of these ascertained and how described? They are found out, are they not, by a concensus of opinions formed in the course of many years by individuals comparing the general effects of one place with the general effects of another. And the means of describing the combined effect of local conditions is generally limited to calling the climate bracing or relaxing, or by terms of similar vagueness. It is impossible to say with any degree of certainty that one place is just as bracing as another. Certainly there is no means of indicating the degree of "bracing-ness" or of "relaxing-ness."

Popularly, climate appears to be looked upon as a condition inherent in a locality, and to be to some extent, at all events, independent of fluctuations in meteorological elements. The writer's idea, however, is that the general climate of a place is merely the mean of the daily climates, and the daily climates may vary considerably—a famously bracing place may on some days be distinctly relaxing. On a given day the weather over the whole or a part of England will be of a relaxing nature, but the local conditions will affect to some extent the degree of relaxing-ness, and probably to a greater extent its duration. So also in regard to bracing-ness. General meteorological conditions will cause a condition of bracing-ness over a large area, but the degree will vary according to local conditions.

In England the variation of climate between place and place and from day to day are, comparatively speaking, so small that the differences, as appreciated by one individual, are hardly susceptible of being compared. But in some other parts of the world it is otherwise. In Shanghai, for instance, great variations occur in the climatic condition; and it is living in that place that has drawn the attention of the writer to the desirability and practicability of a climatic scale.

It will be seen in the body of the paper that the conclusion has been come to, that as regards the effect of meteorological conditions on human sensation, there are two factors incomparably more important than any others, namely, temperature and humidity, and that with the same sensation of climate, temperature and humidity vary greatly and in accordance with a law. For instance, it is shown that when the dry bulb of the thermometer reads 77° F., and the wet bulb 76°, the climatic condition, so far as it can be appreciated by the writer, is the same as when the dry bulb reads 90° and the wet bulb 79°.

There seems to be a great probability that the effect of climate is practically the effect of temperature and humidity, and that if a means of measuring the joint effect of these could be discovered, it would also be a means of measuring the former. It is probable that soil, wind, aspect, rainfall, and altitude are factors in climate chiefly, and in most cases solely because temperature and humidity depend partly on them. This contention, however, must not be strained. But temperature and humidity are at all events very important factors in climate, and if the joint effect of these can be measured, a description of climate is certainly simplified.

The writer has been obliged to coin a new word, "hyther," to indicate the joint effect of temperature and humidity. His idea is that a comparison of the hyther of various places —the maxima, minima, and mean quantities—will give the means by which their relative bracing-ness or relaxing-ness can be ascertained. But before this can be done the laws governing hyther must be ascertained. The writer's little investigation goes no further than to bring forward evidence that such laws do exist, and to enable one to speculate on the form they are likely to take.

As has been said above, if the conditions supposed to govern climate are considered, it will be seen that they are effective in this respect only in so far as they affect temperature, humidity, pressure and sunshine; and, if we can combine temperature and humidity, the principle elements

of climate are reduced to hyther, pressure and sunshine. Thus :—

Rainfall	Humidity Sunshine	
Soil	Humidity	
Altitude	Pressure Humidity	Hyther. Pressure. Sunshine.
Aspect	Temperature Sunshine	
Wind	Temperature Humidity Sunshine	

Before concluding this foreword, the writer would like to call attention to a point which he only just mentions in the paper. This is the extreme condition of temperature and humidity in which life can exist. It would appear that the experimental ascertaining of this for saturation, for dry air, and for air with varying percentages of moisture, would not be difficult; and the discovery of the law governing this extreme degree of hyther would be most valuable in assisting to the discovery of those governing the moderate degrees of hyther.

The writer has long been impressed with the totally inadequate means that exist for denoting those climatic conditions which affect our personal comfort. Here in England (where the writer has resided but little) one hears of a bracing climate, of a relaxing climate, and of muggy weather, and this is about the limit of the popular terminology for the subject. It is much as if, in regard to dimensional measurements, we were limited to describing articles as long, as narrow, as thick, without being able to say how long, how narrow, how thick.

With the comparatively equable climate existing in England, the want of a more exact nomenclature is not so much felt as in some other parts of the world; and indeed on this account the writer feels some anxiety as to his ability to explain his meaning to those personally unacquainted with

extreme climatic conditions. An illustration at this stage may perhaps be useful. In South Australia, with a shade temperature of 115° F., men wear starched collars and work in their offices without punkahs, while in Shanghai, with a shade temperature of 95° F., life may be rendered hardly worth living even with cellular shirts and electric fans. How climate affects us is certainly not indicated on the thermometer or on any other existing instrument. It is indicated as yet only by our bodily sensations, and so far we have no means of describing them.

This then is the subject of this paper—a consideration of the means by which a climatic scale can be arranged for, the desideratum being the formation of a scale by which climate, using that word to denote broadly the effect of meteorological conditions on the human body, could be measured.

As a preliminary to the subject it would be well to consider further how very imperfectly the thermometer serves to measure temperature as felt by the human body. There is, of course, no doubt that as the mercury in the thermometer expands we also experience an increased sensation of heat; but we have no reason to suppose that we feel it in proportion to the rise of the mercury. It does not necessarily follow that equal differences of heat according to human sensation have corresponding equal differences as shown on a thermometer; in fact, it is very improbable that this is so. What is likely, however, is that equal differences of heat, as appreciated by the human body, bear a fixed relation to equal differences as shown on the thermometer, *i.e.*, to use mathematical language, one is a function of the other. For instance, if a large number of observers were asked to estimate the temperature of water according to a scale of 0 to 10, when 0 represented icy cold and 10 as hot as could be borne, the result would be that the "sensation scale" temperatures and the thermometer temperatures would be found to be functions of one another. If the law between the two were discovered it would then be possible to graduate

a thermometer to show equal differences of the temperature of water as appreciated by the human being.

And in analogous manner other sensation scales can be obtained, for example, a scale of light, of sound, of sweetness and bitterness, of smoothness and roughness, &c., &c. The writer considers that the Beaufort scale of wind force is actually what he calls a sensation scale. In it there is one fixed point—a calm—and another more or less fixed point —the observer's conception of a hurricane. Between these two points the observer subdivides into twelve parts representing equal differences of sensation due to wind force. This subdivision into "equal" parts is not done consciously in the majority of cases. In some, perhaps in the greater number of cases, there are more than two fixed points in the scale. For example, the flying of spindrift is taken by the writer as an indication of force 6. But between these fixed points, the scale is divided into the necessary number of parts representing equal differences of sensation.*

Now meteorologists have made a comparison between the wind forces estimated by Beaufort's numbers, *i.e.*, by sensation scale, and the velocities which were found by an anemometer at the same time and place. From the mean of a large number of observations the velocities corresponding to the degrees of Beaufort's scale have thus been ascertained. And what do we find? We find that each velocity is very nearly indeed the same mathematical function of its corresponding Beaufort's number. And what does it signify? It signifies that each degree of the scale bears a definite relation to each other degree—that which each degree represents are either equal to one another or vary according to some law.

Now a clear understanding on this matter of equal degrees of a sensation scale is most important for the purposes of this paper. Equal differences of sensation is an expression

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* This is the writer's idea of the genesis of Beaufort's scale and of the means by which it is now used; but this is not an accepted idea.

made use of in this paper, and requires some explanation. It is hoped that the following information will help make the writer's meaning clear on this matter.

Take a sensation increasing in intensity—say the sensation caused by the wind of increasing velocity blowing on the face. A very small increase in the velocity will not necessarily result in an appreciable difference in sensation. At any one velocity there must be a minimum change of velocity necessary to produce an appreciable difference in sensation in a given observer. This minimum amount will certainly vary with different velocities of the wind, *i.e.*, an increase of two knots would not be appreciable at a velocity of 90′ but would be fully appreciable at a velocity of 3′.

From this idea of a minimum increase in cause necessary to produce an appreciable change in resulting sensation, we arrive at a conception of equal differences of sensation, *i.e.*, we can conceive the idea of the difference between two degrees of sensation equalling the difference between two other degrees of the same sensation.

For example, in Beaufort's scale the appreciation of the difference between wind forces 2 and 3 is the same in degree as the appreciation of the differences between forces 7 and 8. And language is sufficiently elastic for us to use the word "equal" in this connection, and enable us to say that the difference of sensation between that due to wind forces 2 and 3 is equal to that between 7 and 8.

(A further development of the idea of sensation scales is given in an appendix.)

Reverting now to the question of climate. We have instruments of various kinds to measure the different factors which, as far as is known, go to make up climate. It is true that readings of these instruments denote collectively a definite climatic condition, but this climatic condition is not connoted by this one set of readings alone. The writer maintains that broadly speaking any one climatic condition, as indicated by human sensation, has an infinite number of conditions corresponding to it, as indicated by the instru-

ments referred to. In other words, such a climatic condition is indicated by the instruments in the same way that the volume of a solid is indicated by its three dimensions, there being for any one volume an infinite number of varying dimensions.

The human body is in fact a complicated meteorological instrument affected by a number of influences, but capable of combining the effects of these so that its index, the human mind, will show on a definite scale of resulting sensation. The mind, however, for want of practice in the performance of this work, acts as yet but badly. Its indications are but indefinite and often inaccurate; nevertheless they have their value, and the mean of a number of observations should approximate to the truth.

The writer's meaning can perhaps be better understood by stating it in another manner. If any sensation is considered, say the sensation caused by immersing the hand in water, and two more or less definite limits are taken in this sensation, say when it is so cold that it makes one shiver, and so hot that it can only just be borne; then the writer maintains that the mind with practice is capable of graduating this sensation into parts so that each part will correspond with an equal difference of sensation.

In the same way, considering the sensation which climate causes, and to commence with, considering only that condition known popularly as muggy, the mind is capable of dividing this sensation into, say ten "equal" parts between the following limits: (*a*) a condition when, suitably dressed, one experiences no discomfort from mugginess; (*b*) an unbearable mugginess.

But undoubtedly all minds are not without practice capable of this. Indeed, the writer's little experience in this matter was to show that out of twelve selected observers there were only three with fairly good "indicative" qualities.

It is impossible therefore to fix a climatic scale by a mere subdivision of sensation. The only way by which such a scale can be fixed is to find out what varying elemental

conditions of the atmosphere, as indicated by instruments, are connoted by each degree of the sensation scale. Now is this possible? It has been assumed that the principal factors forming climate are some five in number. If a degree on the sensation scale had to be expressible in terms of five varying quantities, the problem would certainly be a very complicated one; probably so complicated that no practical use could be made of its solution. But certainly these five factors are not of equal importance. It seems likely, indeed, that temperature and humidity are so incomparably more important and of more effect than the others, that, eliminating these other comparatively unimportant factors, a law may be found (sufficient for practical purposes) connecting the sensation scale with temperature and humidity alone.

For several years the writer has had the intention of attempting to ascertain whether such a law existed, but it was not till the end of the summer of 1902 that the opportunity occurred, when observations by twelve individuals were made over a period of one month. The results of these observations, limited as they are and dealing as they do only with a warm climate, appear to be of interest, and the principal object of this paper was to bring them to the notice of meteorologists, in the hope that other attempts in the same direction might be made.

The observations made were as follows: A number of persons of normal condition and regular habits were requested to estimate daily at noon the degree of "hyther" on a scale of 0 to 10. This word hyther was introduced to indicate the sensation caused by a warm climate, and supposed to be due to the combined effect of heat and humidity.

Ten represents the very worst day an observer remembers to have experienced in Shanghai—hot, damp and enervating; while 0 represents an ideal summer's day—warm of course, but bright, brisk and bracing, when, suitably dressed, one suffers no discomfort from temperature and humidity.

The regular habits mentioned as a qualification for

ESTIMATED HYTHER BY TWELVE OBSERVERS AT SHANGHAI, DURING AUGUST, 1902.

Day ...	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Dry bulb ..	92	81	83	84	83	83	77	84	80	78	87	90	86	84	73	84	84	85	87	87	91	77	78	82	86	87	88	91	86	79	70
Wet bulb difference	3	4	9	11	11	7	1	5	2	3	10	11	6	5	1	8	8	7	5	7	7	2	5	8	9	7	7	9	4	9	0
Observers																															
1	7	4	3	2	2	2½	3	5	5½	2	3	3	2½	3½	1½	1½	—	—	5	3	6	3½	2	2	2	2½	4	5½	5	2	½
2	5	2½	1	2	3½	2	1	3	4	3	3½	1½	2½	1	2	2½	2½	2	3½	3	5½	3	1½	2	1½	2½	4	3½	3	1½	1
3	8½	7	5	2	2	3	4	4	4	3	3	2½	2½	3	4½	4	4	4	3½	4	5	4½	3	3	2	3	4	5	5	2	1
4	7	3	2	2	0	0	3	3	2	1	0	5	2	2	2	0	0	1	5	7	7	5	2	0	1	4	6	7	9	1	0
5	7	2	4	3	2	2	2	4	4	1	4	3	3	3	1	2½	2	3½	6	6	8	4	2	2	1½	2½	4	6	4½	1½	0
6	6	3	2	3	2	1	2	3	2	1	4	3	3	2½	½	1½	2	2½	4	5	6	5	3	1½	2	1½	3½	4	7	7	½
7	8	2	2	3	0	0	4	5	4	2	2	4	4	6	3	2	2	2	6	4	7	2	2	—	—	3	4	6	8	4	4
8	6	5	4	3	2	2	5	4	5	2	2	2	2	2	1½	2½	4	4½	3½	4	5	3	2½	2	3	3½	4	3	4	2	2
9	6	3	3	2	3	4	3	6	5	4	4	4	4	6	4	3	3	5½	5	4	6	4	3	2	2½	3	5½	6½	6½	3½	3
10	—	—	—	—	—	5	5	6	3	2	4	5	4	4	2	2	1	3	8	7	9	4	1	2	2	7	8	8	8	1	2
11	7	4	2	3	2	2	3	4	6	5	6	6	4	3	3	4	3	4	5	6	7	4	3	4	4	4	5	5	4	2	2
12	7	2	3	3	4	2	5	6	3	2	2	3	4	6	8	2	3	5	—	—	8	3	4	2	2	8	5	7	4	3	4
Mean of 12 observers	6·7	3·4	2·8	2·5	2·0	2·1	3·3	4·4	4·0	2·3	3·1	3·5	3·1	3·5	2·7	2·3	2·4	3·4	5·0	4·8	6·6	3·7	2·4	2·0	2·1	3·6	4·7	5·5	5·7	2·5	1·7

observers included the same daily occupation at noon, and an occupation without rush or worry.

Instrumental meteorological observations, to be compared with the estimate hyther, were taken at Zicawei Observatory by the Director, the Rev. Father Froc, S.J.

The accompanying table gives the estimated hyther by the different observers and the reading of the wet and dry bulb thermometers. Each observer's records were plotted on sectional paper in the usual manner of graphic representation. The vertical line in each diagram represents degrees of the dry bulb thermometer from 70° to 92°, and the horizontal lines represent the difference between the wet and dry bulbs in degrees from 0 to 11. The observer's estimated degree of hyther for each day is placed in the position conforming to the thermometer observations for the day.

Now it is hardly necessary to say, that if in such a diagram points plotted from certain data are found to be in a straight line, or on a fair curve, it follows as a result that the distances by which they were plotted increased relatively to one another by a definite law, *i.e.*, each is a function of the other. The object, therefore, of plotting the hyther numbers in this manner is to see, first, whether as regards each degree of hyther, the dry bulb reading and the difference between the wet and dry bulbs had increased according to a law; and secondly (but this is going much further), whether the same law governs each hyther degree.

If hyther really does depend only on temperature and humidity, then, if the observations have been correctly taken, the hyther numbers would be found in straight lines or fair curves. But it is certain that the observations will not be correct, that the best of them will only be approximately so; so that the most that can be looked for is that the hyther numbers group themselves into zones.

The diagrams have, for simplicity's sake, been plotted by means of temperature and the difference between the wet and dry bulbs, instead of by means of temperature and relative humidity. It is hardly necessary to explain that, as

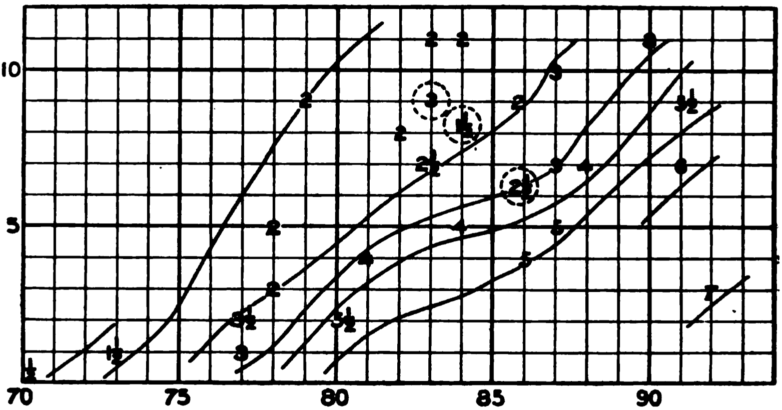


FIG. 1.

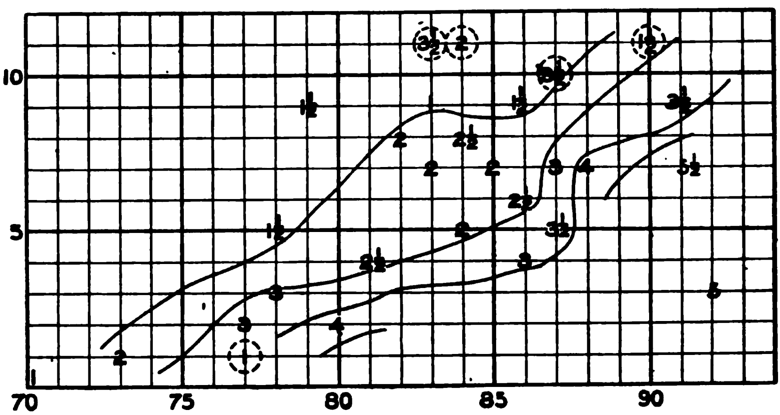


FIG 2.

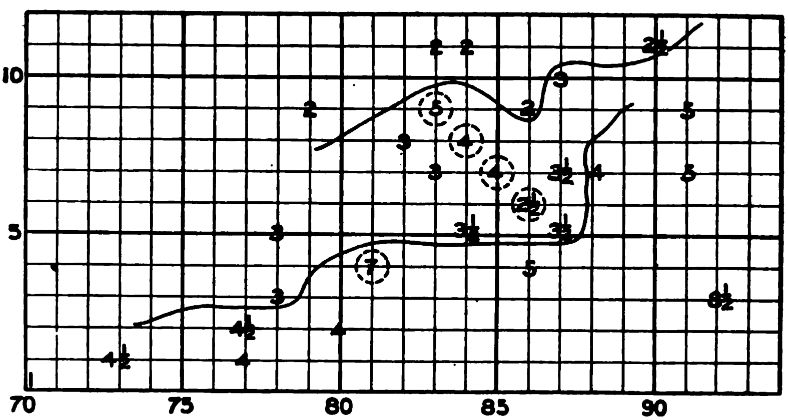


FIG. 3.

humidity is a function of the readings of the wet and dry bulbs, if hyther is a function of the latter it must also be a function of humidity and temperature.

Now look at the plotted diagrams. It will be seen that in the majority of cases—in figs. 4, 6, 7, 8, 9, 10, 12—it cannot be said that the hyther numbers are in zones of their own. But each can be divided in the higher and lower numbers by a line, and in all cases this line has about the same slope, This fact has some significance. There are five diagrams, however—1, 2, 3, 5, 11 in which there are distinct indications of zones. Indeed, in fig. 1 the zones are fairly regular. In each case, however, there are three or more erratic hyther numbers which do not fit in with the zones.

Now are these erratic numbers and the bad definition of the zones due only to poor estimates of hyther, or are they appreciably due also to the existence of other important factors in climate besides temperature and humidity? Let the evidence as to this be examined.

The mean of the observer's estimated hyther for each day is given in the table. It will be seen that this mean is very similar to the record of hyther by observer No. 1. In fig. 16 these two sets have been plotted for comparison. The remarkable conformity between these two curves tend to show that the estimates of No. 1 observer were taken with considerable accurary. There is rarely as great a difference as 1 between them. On the other hand, we find that on August the 8th and 14th the thermometers showed the same value, *i.e.*, 84°, with a difference of 5°; yet on the first date No. 1 observer registered hyther 5, and on the second date hyther 3½. If the hyther estimates by other observers for the 8th and the 14th be examined, it will be seen that in almost every case there was a higher degree of hyther registered on the 8th than on the 14th. This tends to show that though the thermometers indicated the same temperature and humidity, yet the hyther really differed somewhat. On the 16th and 17th, the thermometers again indicated the same; but on this occasion the same

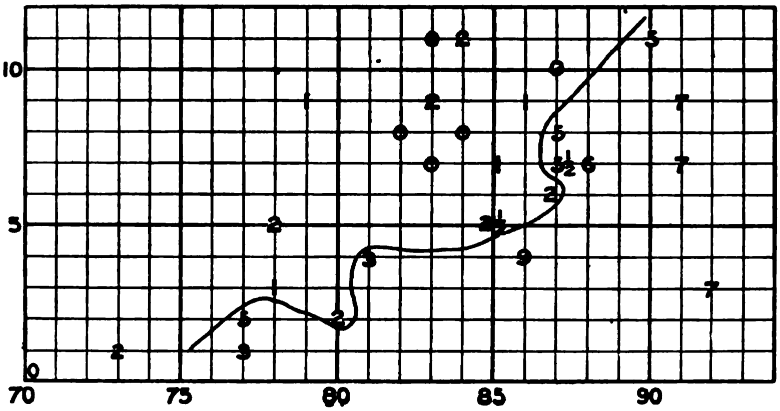


Fig. 4.

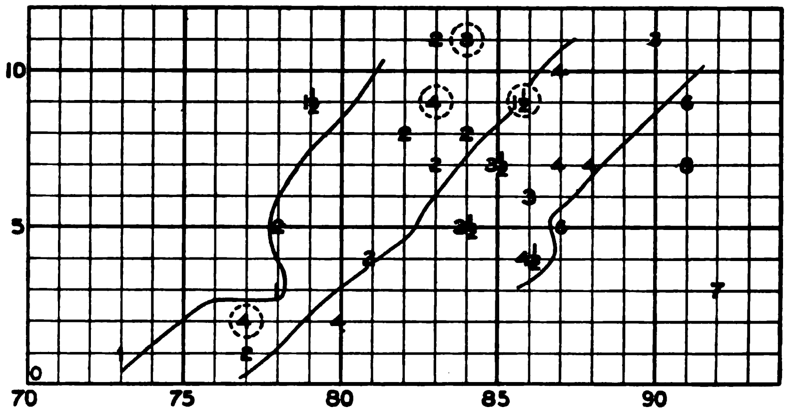


Fig. 5.

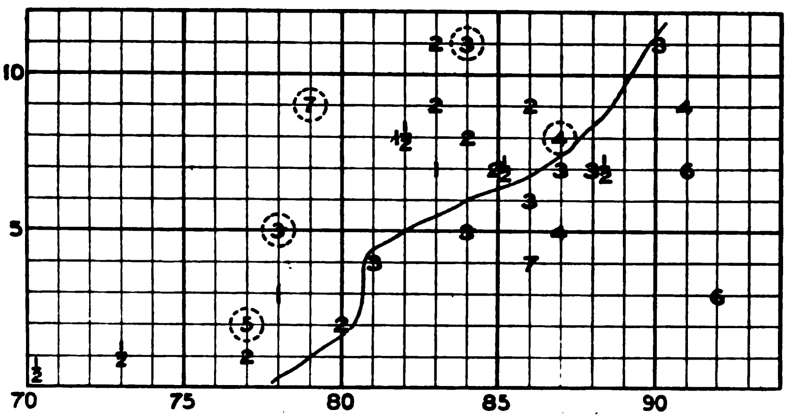


Fig. 6.

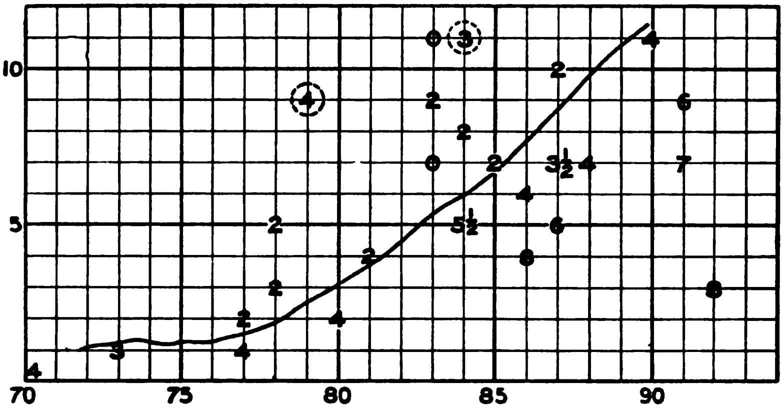


FIG. 7.

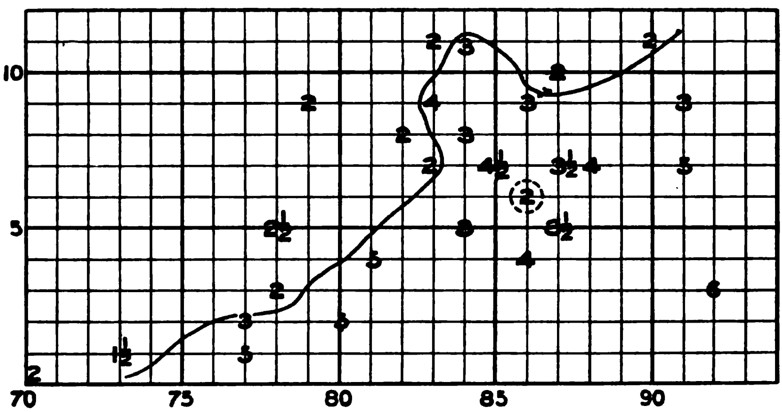


FIG 8

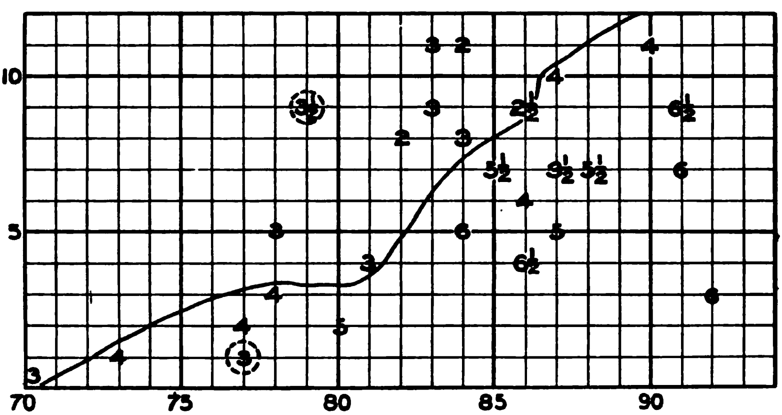


FIG. 9.

hyther was estimated on each day. Again, on the 20th and 26th there is a distinctly higher estimate for hyther on the first date, though the thermometers again indicated the same.

Fig. 13 shows a hyther diagram plotted from the mean values of hyther. Here, as in fig. 1, the zones are fairly well defined.

As far as any conclusion can be come to on the very limited data provided, it would appear that temperature and humidity are certainly the factors of paramount importance in our appreciation of climate, but that some other factor or factors occasionally have appreciable effect. The observations for pressure, wind, nebulosity, &c., have unfortunately been left in China. The writer, however, was unable to connect any one of these factors with the irregularities in the hyther numbers.

Fig. 1 is plotted from the writer's observations. On no single occasion was he aware of the readings of the thermometers when recording his estimate of hyther. That his observations are about the best is doubtless due to the fact that the subdivision of sensation is a matter to which he has given some thought for the past few years, and his mind was therefore better trained for the purpose than that of others.

Fig. 2 is plotted from observations by a gentleman with whom the writer has had no personal communication, and who had never thought of estimating degrees of sensation until reading the writer's pamphlet on his proposed hyther scale. Under these circumstances, it shows the possession by the observer of remarkable indicative qualities.

Fig. 3 is from observations by a gentleman with whom the writer had frequent conversations as to the practicability of establishing a scale. His mind was therefore to some extent prepared.

Fig. 5 is from observations by a young gentleman who became interested in the subject from having typed the instructions to observers.

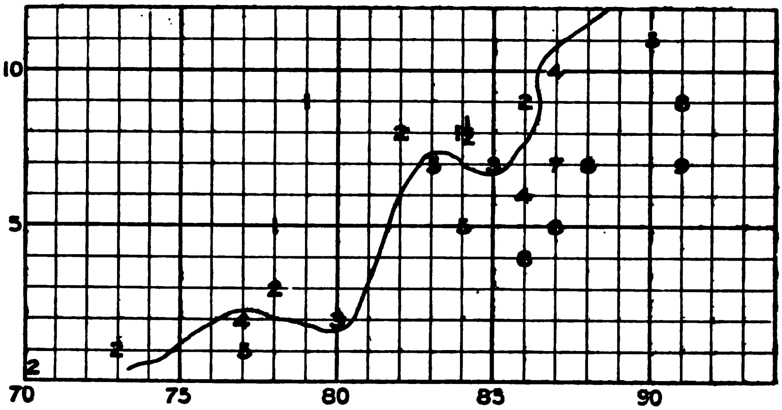


FIG. 10.

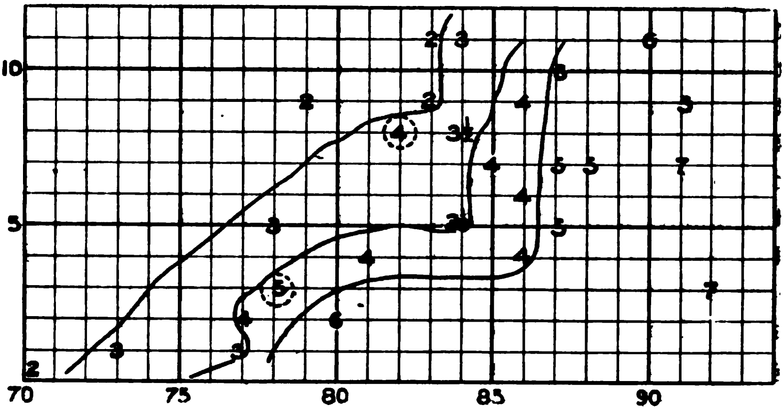


FIG. 11.

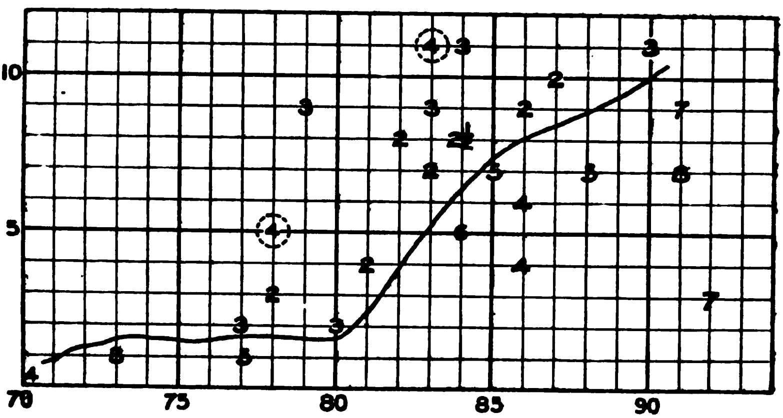


FIG. 12.

Fig. 12, which shows the least indicative qualities of all, is, curiously enough, from the observations of the Director of the Zicawei Observatory, an eminent meteorologist who was good enough to take an active interest in the scheme. It was anticipated that professional meteorologists would be the least likely to have indicative qualities, owing to the difficulty they would have in freeing their mind from a bias due to their knowledge of the elements of climate. It was thought that ladies might serve, on account of their greater sensitiveness, but fig. 6, the only one from a lady's record, shows no special character.

There is one point that has been touched upon in the foregoing that requires some further consideration. This is the statement that for each degree of the sensation scale there are an infinite number of conditions as indicated by the instruments. The idea has been put forward that the human body is a meteorological instrument with a latent capability of indicating on a single scale its appreciation of the infinite number of combinations of the factors which go to make up climate. It must be explained now that this idea is not put forward as representing accurately the real state of affairs, but only roughly so. It is more than probable that the sensation resulting from a combination of a very low atmospheric pressure with considerable moisture and heat cannot be obtained by other conditions of moisture and heat without the low pressure. Still, in regard to climatic conditions due to three factors, it is not impossible that one might say that although the discomfort from these differs in kind, they agree in degree, in the same way as one might say that certain toothache causes the same suffering as a certain earache; *i.e.*, there would be no object in changing one for the other.

However, this matter as far as it concerns three or more variable factors in climate need not be considered further, as the scheme proposed depends on the assumption that temperature and humidity are so paramount in their importance that the other factors can, for the practical purposes of form-

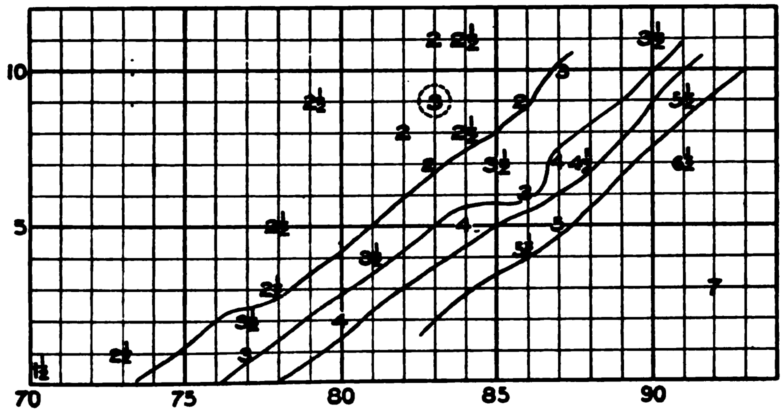


Fig. 13.

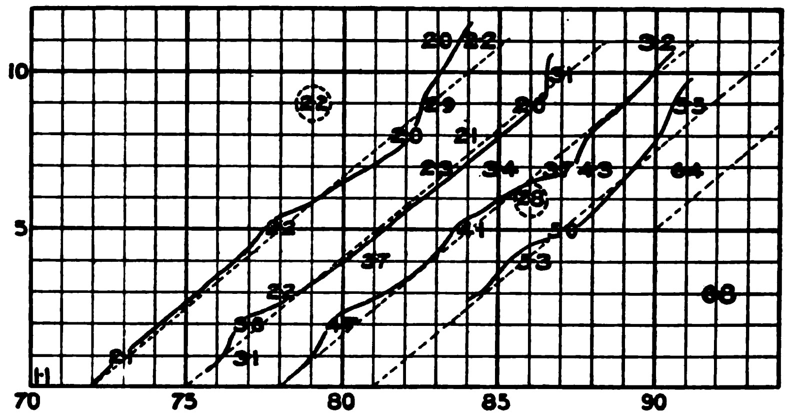


Fig. 14.

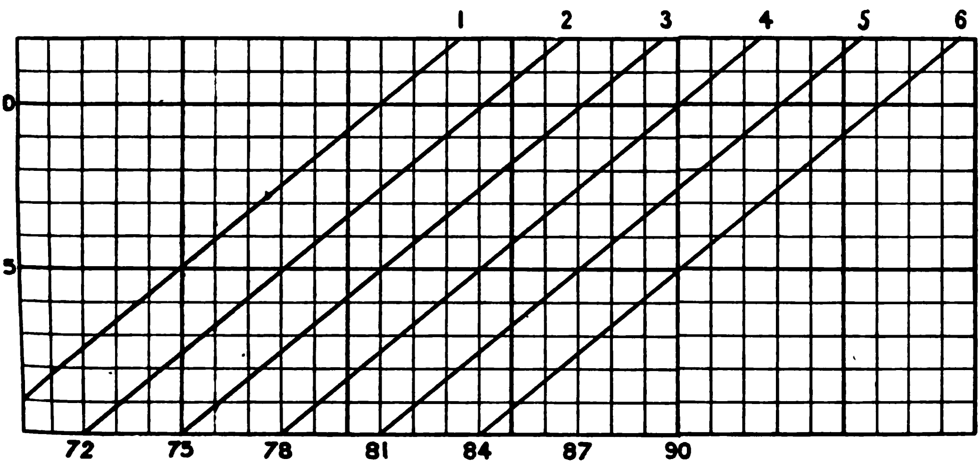


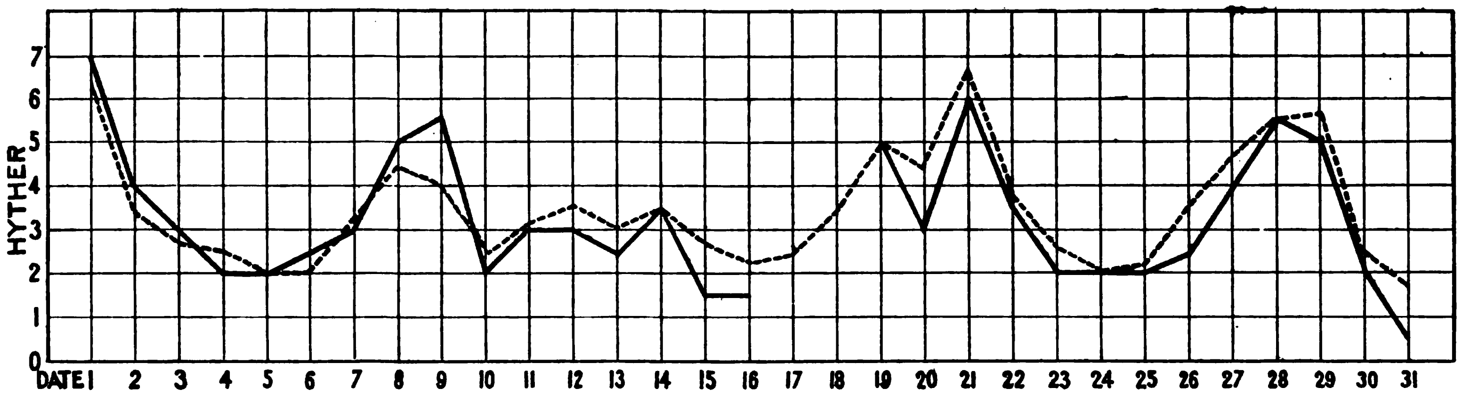
Fig. 15.

ing a serviceable scale, be ignored. But the question still remains how far it may be true that varying conditions of temperature and humidity can have the same effect on human sensation. If fig. 1 be examined, it will be seen that the observer considered that the hyther was 3 when the thermometers were at 77° and 76°, and also when they were at 90° and 79°. To this observer these two conditions of atmosphere appeared similar. Possibly, if he had been able to experience one immediately after the other a difference of kind would be felt, but also possibly not. Anyhow, the two represent equal degrees of discomfort, even if the discomfort differs in kind.

Unfortunately, the number of observations are so few that any definite conclusion from them is at least inadvisable. But there are some indications of interest. The estimates of even the three best observers certainly differ considerably from one another; but there is one important similarity between all the plotted figures, *i.e.*, the zone lines all run in approximately parallel directions—a direction of about tan° $\frac{10}{12}$ to the horizontal. This shows that though observers had different zones, or different limits between which they graduated, yet the law governing the relation of humidity to temperature for each degree of hyther was, as far as can be seen, similar in all cases. If further observations continue to show this to be the case it is certain that a practicable climatic scale can be formed, for it does not matter what symbol is given to any one climatic condition, it does not matter whether each individual experiences the same sensation in a given climate. What does matter, is that the varying atmospheric conditions which a symbol connotes shall appear similar to any one person; and if the plot of hyther zones runs in approximately parallel directions this will be for all practical purposes the case.

Referring again to a consideration of the hyther diagrams, it was considered that possibly more accurate values for hyther could be obtained from a mean of the two curves in fig. 16. The results so obtained have been plotted in fig. 14.

Fig. 16.



HYTHER
7
6
5
4
3
2
1
0
DATE 1
2
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31

In this case we find the zones so distinct that straight lines equidistant and parallel can be drawn which represent very closely zone lines.

It is, perhaps, too early to attempt, even tentatively, to express hyther degrees in terms of the readings of the wet and dry bulbs. But the writer is tempted, on account of the systematic disposition of the zone lines in fig. 14, and for the purpose of showing the possibilities in the idea, to construct a partial table. In fig. 14 these lines are, to all intents and purposes, straight lines, equidistant and parallel, and inclined at an angle of tan° $\frac{10}{12}$ (see fig. 15.)

Under these circumstances, expressions connecting the readings of the wet and dry bulbs for hyther degrees 2 to 5 are as follows:—

$$2 \begin{cases} \text{Dry } 72 + x \\ \text{Wet } 72 + \frac{1}{6} x \end{cases}$$
$$3 \begin{cases} \text{Dry } 75 + x \\ \text{Wet } 75 + \frac{1}{6} x \end{cases}$$
$$4 \begin{cases} \text{Dry } 78 + x \\ \text{Wet } 78 + \frac{1}{6} x \end{cases}$$
$$5 \begin{cases} \text{Dry } 81 + x \\ \text{Wet } 81 + \frac{1}{6} x \end{cases}$$

Or hyther, within the limits observed, can be expressed in terms of the readings of the wet and dry bulbs by the following formula:—

$$H = \frac{d - 1{\cdot}2\,(d - w) - 66}{3}$$

It does not appear that there would be any difficulty in designing an instrument consisting of a hygrometer and a thermometer in combination, which would indicate directly such hyther degrees.

It seems hardly necessary to explain what use a climatic scale would be, even if one were referring only to hot weather. People familiar with such a scale would be to all intents and purposes possessed of a new faculty. Given the readings of the wet and dry bulbs, they would, by means of a table or diagram, be able to ascertain the degree of hyther, and thereby gain a clear mental perception of the climatic condition referred to. The writer and observers 2, 3 and 5 have already to some extent got this faculty.

But to go back to fig. 14 and the formula based upon it. There are several reasons why the apparent significance of it has to be considerably discounted, and why it cannot be accepted except as a very rough representation of the law governing hyther within the limits observed.

In the first place the zones lines can hardly be considered as iso-hyther lines. They are divisions between 2 and over 2, and between 3 and over 3, &c. An examination of the figure shows that to some extent it is a mere coincidence that these zone lines can be drawn so very regularly. Still the figure is significant enough, even allowing this.

Again, that the zone lines are nearly straight lines is a pure coincidence. If, as would have served equally well, the vertical distances had represented the relative humidity, instead of the difference between the wet and dry bulbs, the zone lines must have been curves.

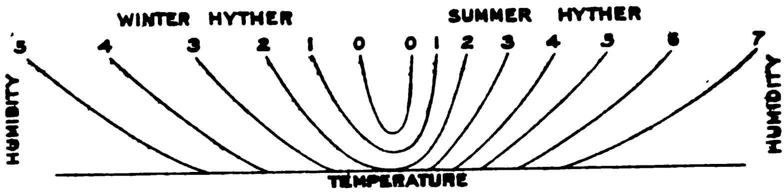
Moreover, the figure has been arrived at and conclusions so far come to entirely on the very limited observations obtained. There are, too, certain general considerations apart from these observations, which must be remembered.

As there are degrees of hyther representing various degrees of bodily discomfort due to heat and humidity, so presumably there are degrees of what may be called "winter hyther," due to cold and humidity.

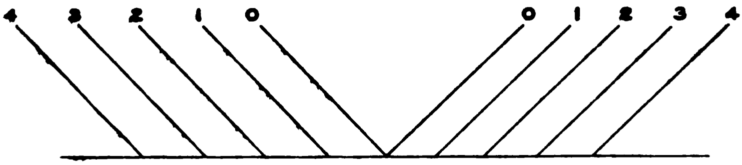
It seems probable also that the hyther is never zero when the air is saturated. The mean estimated hyther for saturation at 70° was 1·7.

Then there is also this consideration. If the laws governing the relation of temperature and humidity for each degree of hyther vary, as it would appear they must, it is certain that they vary according to another law. If this be so, then the areas which are enclosed by iso-hyther lines and, say, a horizontal line cutting them, must also vary in a regular manner.

Allowing the truth of these conclusions, it would appear that a diagram for summer and winter hyther would have something of this form:



That is to say it could not be merely an extension of fig. 15, like this:



The writer fears that the foregoing exposition of his ideas shows some want of consecutiveness and exactness of thought. It would have been better perhaps to have begun by explaining the theory of sensation scales and especially the fact that these deal, not with the measurement of physical quantities, but with the measurement,* in a new sense, of sensation; but the fact is, clearness of thought on this matter came only with the writing of the paper, and the latter therefore represents to some extent the development of the idea.

The writer would be satisfied if, as a result, others would take up the investigation of this interesting subject. It is unlikely he will have the opportunity of continuing it himself.

In conclusion the following remarks are offered in regard to observations.

Unless the daily contrasts in hyther are considerable, the estimation is very difficult. Therefore in England observations of natural climate for the purposes of summer hyther would probably not serve, but on the other hand the British winter climate might serve well for estimating winter hyther. Summer hyther observations should be made in tropical and sub-tropical climates, especially in places where large

* The term measurement has hitherto only been used in connection with physical quantities, but the writer feels justified in putting it to an extended use for the purpose of his subject.

variations of temperature and of humidity occur. In addition, experiments might be made with artificial climates for the higher degrees, especially with the extreme temperatures—which are very high when the air is dry—in which life can exist.

And one more remark as to the value of a sensation scale of climate from a medical point of view. It cannot, of course be assumed that the physiological effects of climate will vary exactly with the subjective effects, but it is certain that they will march much closer to them than to the effects indicated on existing instruments measuring physical quantities.

APPENDIX.

Sensation Scales.

It has been found necessary, for the purpose of developing the idea of sensation scales, to adopt certain terms denoting certain subsidiary ideas, thus :—

Sensation is the physiological effect, of which we are cognisant, of one or more physical causes.

A Sensation Scale is a means whereby the intensity of a sensation can be named.

A Sensation Increment is the minimum appreciable alteration in the intensity of a sensation.

A Physical Increment is the amount of variation in the intensity of the physical cause producing a sensation increment. It is a variable quantity, and by analogy alone it might be assumed that it is some function of the intensity of the physical cause.

Equal differences of Sensation are those in which the corresponding variation in the intensity of the physical cause producing them are proportional to the mean corresponding physical increments.

For instance, let a, b, c, d, be the instrumental measurements of the physical cause producing two pairs of sensation, A, B and C, D, and let w, x, y, z, be the physical increments of these sensations respectively.

Then, if a – b : c – d :: $\frac{w+x}{2}$: $\frac{y+z}{2}$, the difference between the sensations A and B is equal to the difference between the sensations C and D.*

The word "equal" in this connection may be objected to, but it is used as conveying more nearly than any other word the relation between two such differences, for the degree of appreciation of change is equal in each case.

The above is the writer's theoretical definition of what equal differences of sensation are. Practically, equal differences of sensation are those differences which are sensibly similar in degree.

Now in any sensation there are generally to be found two intensities which can be defined with more or less exactness by their correlation with identifiable phenomena, or with identifiable psychological effects. In some cases one of these points can be defined as a zero of sensation.

For example :—

Wind Force.—(1) A calm ; (2) such a force that one cannot stand up to it.

Temperature of a Fluid.—(1) The cold which benumbs the fingers in five seconds ; (2) a heat which is painful to the hand in five seconds.

Light.—(1) Absence of light ; (2) a light that can be looked at only for five seconds.

In forming a sensation scale two such points are selected as near as convenient to both limits of the range of sensation. The observer is then subjected to this sensation in varying degrees of intensity and he estimates, say, the decimal fraction of the interval between the fixed limits.

The nature of the mental process necessary to do this is difficult to describe, but once it is allowed that equal differences of sensation is an existing fact, the chief difficulty in conceiving the idea of the subdivision of sensation between two limits is surmounted.

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* Or more correctly : let x, y be the physical increments corresponding to $\frac{a+b}{2}$ and to $\frac{c+d}{2}$ respectively. Then, if a — b : c — d :: x : y, the difference between the sensations A and B is equal to the difference between the sensations C and D.

It is not maintained that the intervals between divisions of the scale represent equal amounts of sensation, but that they represent equal differences of sensation, *i.e.*, similar appreciations of change.

But whatever the nature of the mental process, the faculty of using it exists, at all events in some people. The writer's observers and himself, in estimating the degree of discomfort from climatic causes, *tried* to estimate the decimal fraction of the maximum discomfort. Considering the short period and the few observers the results showed an extraordinary conformity.

If the writer's personal climatic scale does not indicate equal differences of discomfort, what does it indicate? Not only does it agree closely with a mean of the others, but there are clear indications of the degrees of discomfort being functions of the chief factors in climate, *i.e.*, temperature and humidity.

It is maintained that the mind has an innate, but generally dormant, faculty of subdividing a sensation or emotion, or even a condition. A child, for instance, readily grasps the idea of differentiating her affections. Tell her that she loves her mother a whole twenty shillings' worth and ask her how much she loves you. The answer may not be flattering, but it will be instructive. The child uses what in effect is an emotion scale.

Again the Chinese speak about a person being seven parts ill. This would mean seriously ill. Three parts ill would, say, represent indisposition; while ten parts ill conveys the meaning that the person is dead. This is in effect a condition scale. This as well as an emotion scale cannot as yet be correlated to instrumentally measurable quantities.* They are mentioned only to show the innate faculty of the

* It seems not unlikely that the intensity of an emotion depends on sensation caused by physiological phenomena associated with the emotion. If, then, the cause of the sensation could be measured (for example, arterial pressure in anger), it might be possible to have an emotion scale, the degrees of which could be correlated to instrumentally measurable quantities.

mind to graduate. This faculty has for the purpose of this paper been called "indicativeness."

Many, if not most sensations, have instrumentally measurable conditions corresponding to them in their varying intensities, and the whole object of the writer's idea in regard to sensation scales generally is the establishment of the laws connecting equal differences of these sensations with the instrumental variations corresponding to them, and thereby enable the formation of scales in terms of instrumentally measurable quantities, the degrees of which correspond to equal differences of sensation.

NOTES ON SOME VARIETIES AND PHASES OF THE RHEUMATIC HEART AND THEIR TREATMENT.

BY A. E. SANSOM, M.D., F.R.C.P.

Consulting Physician to the London Hospital, &c.

I HAVE often been told that it is an opprobrium to this generation that the science and art of the treatment of disease have not kept step with the undoubted advances in those sciences and arts which are concerned with the investigation of diseases. I am not in accord with those who adopt such views, and subscribe to the inferences which naturally issue from them. The time of the present generation has been, in my opinion, well spent in patiently clearing away the clouds and mists of mediæval error and superstition which have hung over the fair path of medical and surgical knowledge. The causes course and consequences of disease have been more clearly—though not with absolute precision—traced, and the natural or usual signs and symptoms of disease having been rendered more intelligible to the educated observer the effects of remedial measures have been more carefully estimated and more scientifically interpreted. It is true that this calm and difficult process of enquiry does not commend itself to the imperfectly educated mind. The public generally is still swayed by the advertisements in the newspapers; and in many minds there are lurking tendencies to accept certain systems of cure which some have found to be by no means infallible. It is the experience of many observers that plans of treatment which have attracted thousands have in the course of time fallen into complete oblivion.

Not the least advantage which has followed the patient and systematic investigation of disease has been the rescue of therapeutics from complete subserviency to the physic-bottle, the pill-box and to blisters, plasters, and ointments. The well-considered use of baths, exercises and climate has

been shown to be of equal importance with those means which have been classed as medicines.

The truth must be recognised that all methods of treatment which can minister to the recovery and well-being of a patient should be put in force. Medicines to induce comfort, and to aid in turning favourably the course and current of the processes of disease and other methods which shall tend to bring about good conditions of mind and body.

The practical question for the medical practitioner is *not* "will this or that plan of treatment do?" but "is this the very best treatment that can be adopted for the recovery and future well-being of the patient?"

This communication is not intended to be argumentative or controversial, and yet I think it extremely likely that I shall express views at variance with those of many excellent observers. I hope and believe that I write it with a due sense of responsibility towards those whom I address; yet I do not mean to bring statistical or numerical evidence in support of the opinions I express. I give my opinions for what they are worth; not claiming that they should be accepted without challenge, but following the lines of the well-known quotation modified to the effect that if anyone who reads them finds that, from his own experience, his conclusions are more correct than mine let him detail these opinions in some other place and at some other time; only if unchallenged I shall accept the position that he agrees with me and will adopt them for the advantage of all. I will try to be practical—I say that with a due sense of the difficulties, for I remember a very distinguished member of our profession writing to me to ask me to forward him an article on a subject that had been closely under my own observation with the expression that he knew I should not be "windy." I thought that in the article I had been sufficiently sententious, but one of my reviewers stated that I had been very "windy" indeed.

At the risk of being thought "windy" I must submit my plan. I am not attempting a set picture of diseases of

the heart. I have the highest respect and admiration for such pictures. The pages of such masters of the art of description as Sir Thomas Watson, Sir Richard Quain, Dr. Osler, and of the writers of innumerable monographs and of articles in the great cyclopædias of our time, have given us perfect pictures of the cognate diseases of the heart as they were known at the time of the making of such pictures. They are works which are analogous to those of the great artists of brush and pencil. Mine is a much humbler task—to present a cinematogram rather than a picture, to try to portray the moving phenomena of disease and to suggest the means of treatment which such moving phases indicate.

I am not writing a formal article on pericarditis, myocarditis and endocarditis, as brought about by rheumatism, but on the *rheumatic heart*, and I must at this stage explain my meaning. First, I will mention the varieties and phases which in this communication I propose to consider. They are: (1) The temporarily-swollen or enlarged heart of rheumatism; (2) the heart of rheumatic pericarditis; (3) the heart of rheumatic endocarditis with resulting valvular disease, severe or extensive; (4) the heart of slow and insidious rheumatic endocarditis inducing mitral stenosis.

By "rheumatic" I mean a morbid condition in strict relation with my conception of the rheumatic process—the phenomena of true rheumatism. I do not mean any specially painful implication of the joints. It may seem strange to assert that rheumatism is not essentially a painful disease, but this is my deliberate conviction. The arthritis of true rheumatism is certainly very painful in some cases—painful while it lasts—but it is singularly controlled and influenced for good by medicines, by salicin and the salicylates, and very rarely lasts longer than a fortnight. The pains and swellings of the joints disappear, leaving no permanent morbid changes, though there may be and often are waves or storms of recurrence. There are many causes of arthritis, however, that are not rheumatic. I am of opinion that osteo-arthritis (so-called rheumatic gout) is dependent on many forms of

infection which have no relation with rheumatism, and that the morbid changes in this disease are much more pronounced and more lasting. The pains are much more severe and protracted, and the resulting deformities much more significant than is the case in true rheumatism.

A definition being impossible, I think it will serve the most practically useful purpose to indicate my views as to the varieties and phases of the rheumatic heart if I make my observations from the point of view of clinical diagnosis. Take first the age of the patient under observation.

If such patient be an infant or a child under 12 years of age, and organic disease of the heart be discovered, it is in the highest degree probable that the cause is true rheumatism. A careful differentiation should be made from congenital malformations, but, as the late Dr. Peacock pointed out, the changes of endocarditis (which to my mind are of the truly rheumatic form) are often observed concurrently with malformations of the heart and great vessels.

Recorded cases show, without any possibility of doubt, that endocarditis with subsequent disease of the valves of the heart may occur in intrauterine life. An interesting case has been recorded by Dr. H. Barth, which was carefully observed by the late Professor Peter. The full account is given in the work of Dr. Constantin Paul on "Diseases of the Heart," pp. 743-746. The mother, aged 17, of good health and physique, and presenting no rheumatic nor other morbid antecedents, came into a hospital in Paris for her accouchement. On auscultation of the fœtal heart a loud rough murmur was heard with each ventricular systole, 128 to 130 times in a minute. The birth took place without any unusual incident so far as the mother was concerned, but the infant when born was in a dying state, and no efforts could restore it to life. At the *post-mortem* examination of the infant there was found endocarditis with vegetations over the tricuspid valve; all the structures about the valve had been thickened, and the valve itself was retracted so that tricuspid incompetence resulted. No congenital anomaly

was evidenced, and it seemed conclusively proved that the endocarditis had started after the complete closure of the fœtal apertures. There had occurred an extreme hypertrophy of the right ventricle with dilatation of the cavity.

In a case communicated to me by my friend, Dr. J. O. Tunstall, of Sutton Coldfield ("Diagnosis of Diseases of the Heart and Thoracic Aorta," Sansom, p. 301), the subject being an infant who died about two days after birth; the vegetations of endocarditis were found on the valves of both right and left sides of the heart, but those of the right side were more extensively and profoundly affected; there were the usual thickenings and retractions. In this case also there was no history of a rheumatic proclivity in the mother, and certainly she had not suffered from rheumatism whilst pregnant.

It has been held that endocarditis during intrauterine life more frequently and more profoundly affects the right side of the heart than the left, but Rauchfuss considers that the liability of the endocardium of both sides is about equal. The point of importance to me at the present is that, according to my own observations, the morbid appearances in the endocardium and adjoining structures in intrauterine endocarditis are precisely like those which I have observed in the endocarditis and valvulitis found in association with rheumatism, although no alterations in the structures of the joints have been observed. These are comparatively rare cases, but it is by no means rare to find abundant evidence of disease of the heart in children from 5 to 12 years of age. In some of them there have been pains and swellings of the joints, but such signs are often trivial and evanescent. I have recorded instances in which pericarditis has been manifested with almost no symptoms, none of any grave malady being present. If there be in children, therefore, the absence of indicative signs and symptoms of heart disease, it becomes the more necessary to put in force the methods of physical diagnosis. In children it is needful to do this in a very gentle manner, and happily the most

valuable lessons may be learnt by the use of the simplest means. Inspection of the region normally occupied by the heart may show a localised bulging; the heart has become enlarged; some portions of its muscular cavities have, perhaps, become thicker in substance and more forcible in action than others, or pulsations of the great veins or arteries may be observed. The application of the observer's hand (palpation) serves a further purpose confirming the former observations or establishing new points.

It is of the first importance to ascertain by the application of the hand and fingers the position or positions where the pulsations of the heart are felt. At the extreme left of the area occupied by the heart these pulsations are probably produced by the systole of the left ventricle. Sometimes they are felt in more than one interspace, and there is a *primâ facie* case that then the left ventricle is dilated. The actual muscular wall of the ventricle extends at least a finger-breadth beyond, *i.e.*, to the left of the point or points where the pulsations are felt. This may be more accurately determined by percussion, but the primary knowledge is obtained by palpation. Much more important inferences may be obtained from these observations. The bulk of the heart to the right of the position indicated may be felt to heave and the right ventricle found to pulsate below the margins of the ribs on the left side. There may be turgescence of the large veins and other concurrent signs of enlargement of the right cavities. If such signs occur with pulsations felt considerably to the *left* it is highly probable that the condition is one of mitral insufficiency, but if the *right* ventricle be found to be disproportionately enlarged, and the left ventricle to give little or no evidence of pulsation to the finger, there is probably mitral stenosis. For the most part I endorse the valuable observations of Dr. D. B. Lees in his communication on acute dilatation of the heart in rheumatic fever (*Transactions of the Royal Medical and Chirurgical Society*, 1898, vol. lxxxi., and "Acute Dilatation of the Heart," *British Medical Journal*, January 5, 1901).

Especially I agree with Dr. Lees that the terms "superficial" and "deep" as applied to the percussion evidence of the area occupied by the heart are misleading and should be abolished. I do not quite agree with the observation of Dr. Lees that "a finger of the left hand is by far the best pleximeter," though I do agree with the succeeding words that "it is one which is always available." I prefer to percuss upon my own little pleximeter, because I have proved that thereby the most accurate outlines are obtained, and in children the finger of the percussing doctor is sometimes resented as uncomfortable. These observations are, however, somewhat in the nature of hypercriticism. I have just said that the applied hand or fingers affords the most valuable evidence. I should only add that the hand and fingers should be warm and should be applied coaxingly and gently. The exact outline of the left ventricle can be obtained afterwards by percussion, which should be done in the manner advocated by Dr. Lees. In the case of the left ventricle, as I have before said, this may be felt, and its outline calculated as a finger-breadth over and above the limit of the pulsating area. In regard to the right auricle, percussion alone can furnish an accurate estimate. As Dr. Lees has said: "In health there is always about one finger-breadth of dulness to the right of the sternum in the fourth space, in accordance with the anatomical facts. When the auricle is dilated, as in mitral stenosis, the limit may be two, or even three, finger-breadths to the right of the sternum. This is a most valuable indication of the condition of the right auricle and one too much neglected." I add to this my own conclusions, with which I do not know whether or no Dr. Lees will be in agreement, that percussion in the second left intercostal space affords very valuable evidence. If dulness or markedly deficient resonance be found in this situation it indicates either pericarditis or else a dilatation of the right auricle. Occasionally, as I have demonstrated, though I must acknowledge that this happens rarely, a pulsation of the left auricle is communicated to the left part of this area, but the right

auricle occupies the principal portion, and when there is dilatation of this cavity, the vibrations communicated on percussion are much modified and dulled. The observation of thrills or distinct vibrations in relation with the periods of outflow from the various orifices is of course important. Occasionally some doubt may arise whether they are produced, in the case of coarse thrills, by disordered muscular movement, but pronounced and comparatively fine thrills always indicate a great organic change of a part of the valvular mechanism, and usually the change at the orifice is of a firm fibrous or calcareous nature. It is unnecessary to say that after these methods auscultation should be practised. The danger to my mind is nowadays that an exaggerated value should be put upon the evidence afforded by the stethoscope and the auditory faculty. Murmurs may be deceitful above all things. A systolic murmur at the apex, even though it may indicate some faulty approximation of the mitral flaps, may have very little real significance, for in the course of time there may be a restoration to the normal. Of great importance when such a murmur is found is the degree of pronunciation of the second sound at the apex. I am of opinion that the second sound heard at the apex of the heart is due, and only due, to the recoil against the *aortic* flaps. If, therefore, the second sound be well marked in this situation it is good evidence that the left ventricle is adequate in its efforts to supply the aorta; if on the other hand the second sound is heard faintly or is inaudible there is either considerable valvular imperfection or the muscle of the ventricle is feeble.

The summary of the evidence concerning rheumatic disease of the heart in intrauterine life, in infants and in children, teaches me that disease having the *post-mortem* characters of the rheumatic heart may occur in the fœtus insidiously and without the participation of the mother in the disease—that in infants a like insidious origin and course is usual—that in advancing childhood many cases arise and progress without subjective symptoms, but that in a certain

number the cardiac lesions identical with those mentioned are found in distinct relation with rheumatism of the joints, and the other signs of rheumatic fever which may be severe and frequently repeated.

And now suppose that there come for our examination and opinion an adult, male or female, of the age say 20 to 25. There are a few preliminary considerations before we come to actual physical examination of the heart.

There may be (*a*) history of antecedent rheumatism in any form; (*b*) a history of former heart trouble, probably rheumatic; (*c*) a well-marked condition of rheumatic fever. Of course there may be gradations between these. We have to recollect from personal experience that pericarditis and endocarditis and rheumatic phenomena of severity are frequent at this age.

We make a careful but cautious physical examination, especially remembering that inspection is the first, and it may be the most important, duty of the diagnostician. Palpation also may give important data; percussion, however, is of chief importance, and this should be gently performed. Say that there is dulness manifested in the second left intercostal space. There is a peculiarity about this dulness. It does not shade off, but is complete at once. The outline of the distended pericardium is readily and unmitigatedly shown by percussion; there is pericardial effusion. I do not here mean to trench upon the ground which has been so well occupied by those who have closely mapped out the physical signs of pericardiac effusion in these days—Ewart Roberts in his excellent article in Clifford Allbutt's "System of Medicine," and many others. Of course auscultation will be practised, and the observer is cognisant of the sound of pericardial friction. I may say that I am quite in accord with the older observers who say that the friction sound is heard early and throughout the attack of pericarditis, that the presence or absence of signs of effusion have little to do with it. Thereby it differs much from pleural-friction.

In the matter of the subjective symptoms pericarditis is very variable. In some cases the aberration is little or none.

I have quoted such. In the majority of cases, however, there is very pronounced pain or discomfort, or distress. This is often disproportionate to the physical signs. An attack of pericarditis may commence with signs of profound involvement of the nervous system. I have seen a case ushered in by severe epileptiform convulsions, even when there were no crucial physical signs. Happily in this case though the development of extensive pericarditis subsequently was undoubted there was a good recovery. In other cases the signs have closely resembled those of angina pectoris. I cannot doubt that pericarditis of the rheumatic form is a very serious disease, for, apart from the grave nerve complications, it often means a superadded endocarditis of rheumatic nature, but of great severity, and the prognosis is very bad indeed.

It may be asked with much cogency what determines the difference in the degrees of nerve disturbance in the forms of pericarditis which are nevertheless due to the morbid action of the microbes of rheumatism, the toxins of rheumatism, or both? The answer may be a surmise only, but I think that seeing there is a high degree of nervous endowment of the pericardium, especially in its basic portions, it is probable that when the nerve elements are actively inflamed there is a pronounced condition of pain or of nervous prostration, and when they are not or only very slightly implicated the signs of profound nerve involvement are absent or only very slight.

Now, in regard to *treatment*. As I have said, in some cases there are neither signs nor symptoms to betoken the rise and progress of endocarditis. This is especially the case in mitral stenosis. We can do nothing until there is some declaratory sign.

In a considerable number of the cases there is acute rheumatism with fever or joint affection, or both, to guide us. Then we must do all possible to minister to the comfort of the patient. Rest and comfort are the guiding principles for the chief treatment of the rheumatic heart. In fact, I do not think that I have anything to add to the remarks which were published in the *Lancet* of March 31, 1900. Yet I think

we have much to say in regard to treatment after the most acute periods have subsided. I well recollect the olden times when any thought of moving a cardiac or rheumatic patient would have been considered the worst possible policy. Now, however, we are convinced of the value of a gradual training, remembering always the danger of overstraining, and we have given up for good all the notion of finality and non-recovery of the valve lesions engendered by rheumatism.

It is common knowledge that oftentimes a case left to itself, with its usual home surroundings, does not get better, but if the case be removed from home, and change of air, scene and treatment of hope be practised, then there is gradual and unexpected amendment.

We accept, therefore, the doctrine that the forms of cure in health resorts, as adopted long ago by our Continental neighbours, are fraught with much good, though we reserve our right to criticise the conditions obtained and the loud-tongued reports as to certain methods adopted in certain places. We are even sceptical as to whether satisfactory cures cannot be obtained in this country, though I agree with the opinion enunciated by Dr. Leonard Williams, that the climatic stations and health resorts generally, where the greatest efforts are made in the direction of amusement and occupation for invalids, are to be found not in this country, but abroad. The municipalities in this country, with very few exceptions, are incurably pig-headed and insular in this matter (*Clinical Journal*, September 16, 1903, p. 349).

Let us briefly think over the principles of our action in this matter. We want first an encouragement for the recuperative mechanism. The complete change and the happy surroundings accomplish this. We can hardly now consider adequately the question of climate. This varies at different seasons of the year, but it is hard if we cannot find some satisfactory place in England or Wales, Scotland or Ireland. Failing such a happy find we have the whole world to run through.

Then we have bathing facilities, douches, &c. Can they do anything to cause absorption of some of the vicious excres-

cences and swellings brought about by rheumatism? I think they can; my friend Dr. Blanc, of Aix-les-Bains, certainly has brought forward good evidence that they can, and we know and have had personal experience, many of us, that the effervescing baths of Nauheim and elsewhere can be effectual for good. All these plans can be and are well carried out at Harrogate, Strathpeffer, Buxton, Sidmouth, Llandudno and elsewhere in our own country, as well as in Ireland. Then there are the exercises which also are fraught with good, whether accomplished by mechanical means (Zander) or by educated resisters, the "widerstand gymnastic" of Nauheim, or self-imposed, as walking, cycling, or respiring, as may be enforced there. I may say that personally I do not care much for any elaborate exercisers that may be bought. A towel is an ever-present thing, and this serves the purpose well of a guide to system and symmetry. Let the first duty of the recovering patient be to quietly rub the whole body with the towel. Then, standing up to use it as a measure of symmetry, making the right limbs do the same duty as the left—then to bend forwards holding the towel always symmetrically so as to expand the upper parts of the chest—then bending low to compress the abdomen.

If these actions be done deliberately and quietly five, ten, fifteen or more times each as time goes on, we have a very efficient method of gymnastic training, always remembering that pure air is to be breathed at the same time. Then will come the turn of the baths and douches, and these are sure to be of a lower temperature than that of the blood. No coddling here, no straining, but gradual training.

I know I have failed to mention many good places where the pleasant air and climate are accompanied by systematic baths and exercises, and, of still greater importance, are under the watchful eye of a good doctor ready to help to encourage or to restrain. These are, I consider, the greatest, the most efficient means to restore the damaged membranes, or bring about compensation by educating the muscular chambers of the heart to practically overcome their difficulties.

ON SULPHUR BATHS.

BY P. ROETHLISBERGER, M.D. (BADEN, SWITZERLAND).

Both during and after the Roman times, the curative power of sulphur water was well known, and some of the hot sulphur springs attained a reputation throughout the whole civilised world.

The originating of scientific medicine in the latter half of last century (marked by the second Vienna school) entirely cleared away all empiricism, and above all, radically exterminated everything that had the slightest mystic appearance. Whereupon the sulphur baths, with all the wonderful and mystic actions attributed to them during the middle ages, became despised, and were credited only with the merit of some obvious effects on certain parasitic skin affections. The same thing happened to many other sanative methods; being apparently devoid of scientific foundations, they fell into contempt.

Equal misfortune overwhelmed the whole of balneotherapy, including hydrotherapy, and it is only since Winternitz's pioneering work that the latter has regained a measure of the physician's confidence.

Winternitz's experiments proved the distinct action of simple water of different temperatures and applications on the circulation, respiration, metabolism and temperature of the human body.

Later, the curative effects of salt water baths, especially in the form of sea-baths, became appreciated, and later still, in our own times, the value of carbonic acid baths has found a general acknowledgement.

On the other hand, there being few scientific investigations on the action of sulphur baths, almost everybody identified

their effects with those of ordinary water of similar temperatures.*

Very little appreciation or attention has apparently been bestowed on the publications of such authors as Alexander Remond† (1873) and Grandidier,‡ (who pointed out a distinct diminution of the pulse rate caused by sulphur baths); or the results of experiments made by Dronke§ (1887), Beissel‖ (1888), and Verdinal¶, who succeeded in demonstrating a definite effect by these baths on the human metabolism, in the way of more active oxidation, and Censier,** who in the baths of Bagnières de l'Orne, observed an approximation of the internal and external temperatures of the body due to them.

The therapeutic agent that has proved of so much value for so many centuries must surely depend on more than the effect of mere temperature alone.

Realising this, I was led to make some experiments with our hot sulphur springs at Baden (Switzerland). The experiments made were on the temperature of the body, the arterial tension, the character of the pulse, the number of pulsations and respirations, the nutrition, and the muscular strength; and I was not a little astonished at the great harmony and clearness of the results.

These thermal springs at Baden contain proportionately: Aqua, 10,000 grammes; sulphuric acid, 14·6 grammes; chlorine, 11·9 grammes; sodium, 7·6 grammes; calcium, 5·9 grammes; carbonic acid, 6·37 grammes; and besides these many other substances in rather smaller quantities, including boric acid and arsenic.

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* H. Weber and F. Parkes Weber, Fromm, Flechsig, Egasse, A. Guyenot, &c.

† Alexander Remond, "Die Schwefelquellen," p. 371, in Valentiner's "Balneotherapie." Berlin, 1873.

‡ *Cit.*, J. Glax, "Lehrbusch der Balneotherapie," 1897, p. 244.

§ F. Dronke, "Weber die Einwirkung des Schinznacher Schwefelwasser auf den Stoffroechsel," *Berliner Klinische Wochenschrift*, 1887, p. 49.

‖ J. Beissel, "Balneologische Studien mit Bezug auf die Aachener und Burtscheider Mineralquellen." Aachen, 1888.

¶ *Cit.*, G. Morice, "Mementos de Medecine Thermale," 1900.

** *Cit.*, G. Morice.

They have a temperature of 119° F., a specific gravity of 1.0040, an electric conductibility of 5.9876, and a freezing point of 0·180°.

Temperature of the Body.

About forty series of experiments on different persons establ- ished the fact that in the baths and for a considerable time afterwards (an hour or more), the temperature of the rectum showed a marked diminution, whereas the external (axillary) temperature increased, or remained stationary in baths varying from 88° to 100° F. In water of 100° to 100½° the heat of the rectum decidedly rose, but dropped below normal after the baths.

According to Stifler,* just the opposite effect is produced by fresh water baths of corresponding temperatures.

The Circulation.

The number of the heart's pulsations were distinctly diminished in the baths at a temperature of 88° to 93½° F., the decrease frequently amounting to 7 and 10 in the minute. This diminution not only took place in the baths, but also for a good while afterwards; whereas the number of pulsations *increased* in baths of 97° to 100½°.

The blood pressure, controlled by Basch's sphygmomanometer and Gaertner's tonometer, was very little lowered by the warmer baths, but was increased by the cooler ones. The pulse curve noted by Jaquet's sphygmochronograph, was taken before, in, and after the bath, and was undoubtedly influenced by the process, showing certain main and constant features not produced by fresh water, but yet occurring in carbonic acid baths† without sulphur. The principle feature in and after the sulphur baths was that of a pulse *with increased*

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* Stifler, "Vortrag gehalten an der 20, oeffentlichen Versammlung der Balneol., Gesellschaft, 1899. Veroeffentlichungen der Hufelandschen Gesellschaft in Berlin." Berlin, 1899.

† Julius Rosenthal, "Ueber die Bedentung Kissingens als Kurort für Herzkranke," *Therapeutische Monatschrifte*, May, 1901.

Stifler, "Ueber Herzheilbäder," *Münch. med. Wochenschrift*, 1901.

velocity and height of the primary wave, and multiplied minor waves on the descending limb.

These characteristics are probably the signs of an active peripheral vaso-dilatation*, and enforced diastolic and systolic action of the heart.

Respirations.

At the very commencement of all baths the number of respirations increased, and remained more frequent in the warmer ones ($98\frac{1}{2}°$ to $100\frac{1}{2}°$); in the cooler baths the respirations became normal again, or even subnormal, this diminution continuing and being more evident after the baths, at the same time the respiratory excursion became wider.

Nutrition.

The chief object of the examination in several series of experiments upon two different persons was the excretion of the total nitrogen and the chief substances containing it, as urea, ammonia, uric acid, xanthin or alloxuric bases, as well as a number of substances free from nitrogen, such as chlorides, phosphates, sulphates, non-oxidised sulphur and acid phosphates.

The excrements when examined were only fully tested as to the amount of nitrogen they contained.

These two persons always received at intervals before, during and after the baths, exactly the same quantity and quality of liquid and solid food. The intervals before bathing had to be very extended, in order to get a constant nitrogen excretion. Through the different experimental series, in the intervals during and after bathing, we met with a ***very marked increase of urea*** in proportion to the total nitrogen, showing, therefore, amelioration of the oxidation coefficient of the nitrogen, *diminution of the xanthin bases, distinct lessening of the acidity of the urine* (or acid phosphates), *a decrease of the total phosphates* and *augmentation of the total sulphates,*

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* Hensen, *cit.*; Rosenthal, *loc. cit.*

the latter at the expense of the ***diminished non-oxidised sulphur***. A matter of some value no doubt, was the regular increase of hunger and thirst in the intervals during bathing; the food given, though very sufficient in the periods before the baths, was always found to be insufficient afterwards; besides which, the intestinal absorption in the first-mentioned periods was undoubtedly improved, the quantity of the fæces, and their amount of nitrogen, being decidedly lessened.

MUSCULAR STRENGTH.

The muscular tonus was estimated in the usual way by the dynamometer; each value being the result of numerous measurings. After the cooler baths (88° to 93°) we met with an augmentation, and after the warmer ones (99° to 100½°) with a diminution of the muscular power.

All the chief alterations of the metabolism produced by the sulphur baths of Baden, as well as their influences on the temperature and circulation of the body, are so striking and so regularly met with, that the impartial observer can but admit that certain specific actions are the result of these baths.

The special character of a mineral water would, to my mind, depend on its amount of skin-irritating salts and gases. The nervous and vascular cutaneous reaction due to this irritation, and to a certain extent increased or modified by the temperature of the water, seemed clear enough in our cases. One has only to examine the changes in the temperature of the body, and also of the pulse tracing after the bath, to be convinced of the vascular effects. The temperature being lowered in the interior of the body while rather increased on the exterior, and the pulse curve showing a full dilated radial artery, are distinctly signs of a deviation of the blood current from the inner organs to the peripheral vascular area. I may be permitted in this connection to remind my readers how frequently we meet with visible flushing of the integuments, or how often repeated bathing brings on con-

siderable itching. In former times* the baths would not have been considered efficacious, if in the middle of a thermal cure a certain form of eczema had not appeared.

The improvement in the metabolism is probably the result of alterations in the circulation, as well as of a reflex action from the excited cutaneous nerves.

It is probable also that the temperature of the bath is of great importance. Through the congestion of the peripheral vascular area in a bath of 89° to 93° (these being the temperature of the baths for the respective experiments) a somewhat considerable loss of heat must have taken place; this loss would very likely produce an excitation of the calorific organs, and consequently an increase of the oxidising processes of the body.

The results of my experiments seem to me to be of sufficient interest and importance to warrant their publication, and I should be glad if these experiments could be repeated by other observers for purposes of confirmation and comparison.

P.S.—Detailed accounts of my experiments, their several methods of examination, with exact tables of results, including a certain number of pulse curves, will be found in the April and August numbers, 1903, of the *Archives Generales d'Hydrologie, de Climatologie et d'Hydrotherapie; partly in the Zeitschrift fur diätetische und physikalische Therapie*, 1901-1902, Band v., Heft viii., and also in separate pamphlets, published for the Casino Society, Baden.

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* Kottman, Dr. J. K., "Ueber die warmen Guellen zu Baden im Aargau, oder die Trink und Badekuren daselbst." Aarau, 1826.

THE PHYSIOLOGICAL ASPECT OF CLIMATE.

BY THE LATE SAMUEL HYDE, M.D.

As a useful introduction to a discussion of the remedial influences of climate, we cannot do better than study the effects of climate upon the healthy organism and the influence of climate in the production of disease. The physiological effects will be best considered under the following heads :—

(1) High temperatures. (2) Cold or low temperatures. (3) Humidity. (4) High atmospheric pressures. (5) Low atmospheric pressures.

Effects of High Temperatures.—All living organisms depend upon temperature, and it is only possible for life to exist within certain temperature limits. These limitations differ in different living organisms; temperatures which suit some organisms being extremely fatal to others. Man is peculiarly amenable to limitations of temperature, extremes of cold or extremes of heat jeopardising and even extinguishing life in his organism; hence the important part played by temperature in climatic environment.

Heat promotes cell-growth although a smaller amount of food be taken into the organism, but high temperatures lower muscular and nervous tone and promote earlier decease.

It is difficult to establish the maximum limit of temperature for living matter, but it may be taken as the point at which coagulation of the proteids in the substance of the living cell takes place. It is known that in the life of the cell the proteids play the most important part, therefore when the heat is so great as to coagulate and solidify the dissolved proteids the process of metabolism or life ceases.

Coming now to a consideration of the influence of high climatic temperatures upon the human organism, it will be convenient to consider briefly the effects of hot climates on the more important organs of the body.

(1) *On the Brain and Nervous System.*—Whilst a hot

atmosphere acts first as an excitant, this influence is of passing duration and the general effect of a hot climate is that of a depressant. Such a climate exercises a distinctly sedative influence on the sensory nerves, the painful conditions of which are often less acute under such climatic conditions. If an individual used to a cold or temperate climate be exposed for a lengthened period to a climate of high temperature, there is produced in such an individual general nervous depression, langour, drowsiness and muscular weakness; and, if the heat approach the extreme limit before referred to, convulsions and coma may be induced. Owing to the extreme vaso-dilatation affecting the cutaneous blood-vessels, a partial emptying of the deeper blood-vessels and a slowing down of the general circulation results, and this is followed by more or less anæmia of internal organs, including the brain and spinal cord.

(2) *On the Heart and Circulation.*—Hot climates accelerate cardiac action and produce vaso-dilatation of the superficial blood-vessels. In addition to redness and hyperæmia of the skin, owing to the dilatation of the superficial vessels, very marked effects are also produced on the general vascular system and circulation.

(3) *On Respiration.*—The respiration is at first accelerated by exposure to a hot temperature, but if the exposure be long continued the respiratory movements become slower.

(4) *On the Temperature of the Body.*—It may seem anomalous, but it is nevertheless true, that the first effects of exposure to a hot atmosphere are really cooling effects, and more heat is radiated from the body during the exposure. It is owing to this that the body is able to endure for long periods an excessive temperature of the atmosphere without the normal temperature of the body being appreciably raised. This compensation in the body heat is effected by the dilatation of the superficial blood-vessels, the increased secretion of sweat, and the accelerated respiration with its increased excretion of the products of combustion and watery vapour. There is also probably some modification in the heat-producing

mechanism of the system by which it is slowed down, so that the compensatory elimination of heat becomes more easy and certain.

(5) *On Secretion and Excretion*.—The influence of hot climates on secretion and excretion is most marked in the case of the sudorific glands which are rendered more active and pour out their sweat in increased quantities. The excretion of watery vapour from the lungs during the respiratory process is also increased, and the excretion of carbonic acid from the lungs is increased owing to stimulation of the process of metabolism. Hot climates also increase the intestinal secretions, and thus favour diarrhœic disorders.

Effects of Cold or Low Temperatures.—Animals can bear an extreme limit of low temperature proportionately greater than the limit of high temperature. Poikilothermal animals may be frozen without destroying their vital energy. The experiments of Kühne and Kochs lead to the conclusion that when the living substance of the tissue-cells itself is frozen solid the animal organism dies. On the other hand, Raoul Pictet's investigations support the assumption that "in individual cases the living substance of cells can be frozen to ice without losing its capacity of life."

In his experiments Raoul Pictet cooled down fishes in a block of ice to 15° C., and, after carefully re-warming, some of them remained alive, but fishes cooled down to 20° C. died; frogs, however, were found to endure a cooling process down to 20° C., and revived, whilst snails bore a temperature of 120° C., and bacteria could be cooled down to a temperature below 200° C. without life being extinguished. From these experiments the interesting question arises whether, when living organisms are thus frozen, the vital processes do actually come to a standstill. It would seem possible that the cell liquid may be frozen without the loss of its vitality, but experiments have hitherto failed to conclusively prove this. As, however, it is an established fact that dry organisms can maintain their life for hundreds of years, it would seem probable that the vital processes of living substances in the frozen

state may also be suspended for an indefinite period of time, afterwards to be brought into action by the application of warmth.

The physiological effects of cold climate on the animal organism may be divided as in the case of the effects of high temperatures.

(1) *On the Brain and Nervous System.*—When the body is exposed to a low atmospheric temperature there is produced a general sensation of cold, and if the exposure be sudden it is followed by deepened and quickened respiration. If the exposure be not too severe nor too prolonged, these effects are quickly followed by a reaction, the surface of the skin becoming reddened and a sensation of glowing warmth produced. The vascular contraction of the superficial blood-vessels causes temporary hyperæmia of the deeper viscera, including the brain and spinal cord, which causes nervous exaltation and a general sense of invigoration. These reflex influences of atmospheric cold are brought about by stimulation of the peripheral ends of the cutaneous nerves. The stimulating and tonic effects, however, of atmospheric cold are only the primary effects, and if the intensity of cold be prolonged, especially if at the same time there is an absence of food and exercise, the cold acts as a direct depressant of the nervous system.

(2) *On the Heart and Circulation.*—The first effects of atmospheric cold are to reduce the number of cardiac pulsations and to lower the general blood pressure, whilst at the same time there is vaso-contraction of the superficial blood-vessels with a corresponding dilatation of the deeper blood-vessels and hyperæmia of the internal organs. If, however, the exposure be not unduly severe and prolonged, and a sufficiency of food and exercise be provided, there follows a reaction, the superficial blood-vessels showing some amount of dilatation, as evidenced by redness of the skin, and at the same time the hyperæmia of internal organs passes off, and a general recovery of the vascular tone is brought about. If the body be exposed for an extreme length of time to excessive

cold, without the supply of proper food, paralysis of muscles and nerves takes place, and the blood becomes coagulated.

(3) *On the Respiration.*—Atmospheric cold causes at first deeper and quicker inspirations, to be followed later by slowing respiratory movements which become not only less frequent, but more shallow. If the exposure approach extreme limits, then symptoms of asphyxia and suffocation are produced, which may lead to the death of the subject.

(4) *On the Temperature of the Body.*—The first effects of atmospheric cold are to cause a slight rise in the temperature due to the stimulation of the skin. This reflex influence of cold upon the cutaneous surface brings about more rapid metabolism within the body, and this results in an increased output of heat, whilst the contraction of the superficial blood-vessels causes a diminution in the normal amount of heat passing off from the body surface. It must, however, be pointed out that although this increased metabolism within the body causes a greater proportion of heat, continuous exposure to atmospheric cold gradually brings about a decrease in the body temperature, owing chiefly to conduction of heat from the body into the atmosphere.

The living body is able to bear a much lower temperature of atmospheric cold if the air be at rest; hence, when the atmosphere is in motion and winds are blowing, the effects of low temperature are intensified. The administration of alcohol also accelerates the cooling process in mammals, which explains why drunken persons are more liable to die from exposure to cold than are individuals free from the influence of alcohol.

(5) *On Secretion and Excretion.*—The influence of climatic cold on the secretion of the kidneys, which are greatly stimulated, is very marked, whilst the secretion of the sudorific glands in the skin and the sweating process are retarded. It is probable that the secretion of bile in the liver is encouraged by atmospheric cold, owing to the vascular contraction of the superficial blood-vessels which causes temporary hyperæmia of the internal viscera. The muscular tone of

the intestines is stimulated and regular action and excretion favoured. The experiments of A. Rohrig and N. Zuntz upon animals, and by Prof. Leibermeister, Dr. L. Lehmann and Dr. T. Gildemeister upon men, referred to in the chapter on the physiological action of cold baths, would appear to prove that a large excess of carbonic acid is eliminated from the body under the influence of extreme cold over that given off under normal conditions of atmospheric temperature.

Effects of Humidity. — The physiological influence of humidity is of interest, seeing that the amount of aqueous vapour in the atmosphere bears an important relation to the respiratory and other processes of the living animal. When the air is dry more aqueous vapour is exhaled by the breath expired from the lungs than when the air is more humid. Warm air contains more vapour than cold air, therefore less vapour is exhaled from the lungs in warm air than in cold air. The evaporation of heat from the body is hindered in a warm humid atmosphere, whilst the loss of heat from the body is facilitated when the air is dry and cold. Humidity also exercises a great influence on the secretion of sweat by the skin, which is increased in dry air and diminished in moist air. In warm humid air the perspiration is more apparent or visible, being condensed in drops or beads upon the skin. This is, however, due to the already saturated air being unable to absorb the sweat with sufficient rapidity to dry the skin and not because the perspiration is more profuse than in warm dry air. Dry air increases the evaporation from the skin and exercises a cooling effect upon the body. This explains why a higher temperature can be borne more easily in a Turkish hot air bath than in a Russian vapour bath. Likewise cold as well as heat are borne more readily if the air be dry than if it be moist.

BRITISH BALNEOLOGICAL AND CLIMATOLOGICAL SOCIETY.

THE First General and Annual Meetings were held at 20, Hanover Square, London, on Friday, October 30, 1903, Dr. ALFRED F. STREET, M.A., M.D., B.C., D.P.H.(Cantab.), of Westgate-on-Sea, in the Chair.

General Meeting (under the Presidency of DR. SYMES THOMPSON).

TREASURER'S REPORT.

Dr. HARRY CAMPBELL, in presenting his report and balance sheet, announced that the finances were in a perfectly satisfactory condition, and that the balance over liabilities was £58 14s. 10d. The Council had decided to pay off entirely the moneys owing to Messrs. Bale and Sons, the printers. Henceforth it was hoped to pay off each year's liabilities as they became due.

The adoption of the report and balance sheet was unanimously carried.

The PRESIDENT (Dr. Symes Thompson) said it now became his pleasure to transfer the presidential office into the hands of his successor, Dr. Street. Dr. Street came as the representative of one of the most beautiful climates possessed by this country. It was quite right, bearing in mind the title of the Society, that both the climates and the baths should be represented. The Chair had been filled the year before he took office by a representative of balneology, and he now had pleasure in asking the Society to receive one who stood for the climatological half of the work. All must recognise the enormous value of the Isle of Thanet as a health resort. Dr. Street had been associated with the Society from its start, had been a vice-president, was a distinguished Cambridge graduate, and a representative of St. Bartholomew's Hospital.

He was sure to be received by the Society with great appreciation during his presidency, and if his term of office proved as happy a one as his own, he was to be envied.

Dr. Street then took the Chair, and thanked the Society for the honour which it had unexpectedly conferred upon him. He also thanked Dr. Symes Thompson for the kind words with which he had introduced him. He had only to say that he would serve the Society to the best of his ability, and do his best to uphold its honour and dignity.

Dr. Bagshawe (St. Leonards) proposed a vote of thanks to the retiring president. It was well known that the initiation of the Society was largely aided by Dr. Symes Thompson. He helped it forward in its early days, and he had been the first representative of the profession in London to occupy the Presidential Chair. In the wisdom of the Society—and perhaps for the time it was well that it should be so—it was ordained that the Presidents should hail from the provinces, as was the case with the old British Medical Association. But that had not prevented the London men who had been good enough to join the Society from performing the most useful work for it up to the present time. About a year ago it was decided that a London representative should now and again be asked to preside; and the Society had been singularly fortunate in having Dr. Symes Thompson as President, for one could not point to any in the profession who had studied climatology more closely. In his presidential address delivered at the opening of the previous session he had taken his colleagues in imagination through South Africa, through North Africa, the Nile District, and many other parts of the world, and he was looked upon as one of the first climatologists of the day. He had come to the Society's aid many times, and once at very short notice; and, with the hearty concurrence of the meeting, he returned to that gentleman its warmest thanks for the way he had presided over its meetings.

Dr. Felkin (London) seconded, and it was carried by acclamation.

Dr. Symes Thompson, in reply, thanked Dr. Bagshawe and Dr. Felkin for the kind words they had used in connection with the vote, and the Society for its reception of it. It had been an enormous pleasure to him to serve in the Presidential Chair. The opportunity of meeting, in that room, representatives of balneology and climatology in Great Britain and Ireland was of immense value, and it had been a great privilege to entertain many of the members in his own house. And he would no longer be able to ask members, as President, to repeat the honour, but he was an honorary vice-president, and perhaps at some future time he could ask them in that capacity. He thanked the Society from his heart for the cordiality it had shown, and the appreciation with which his efforts had been met. He thought the Society had done an immense deal for climatology, and had placed the study on a more scientific basis than ever before. As the years went by he believed balneology and climatology would make great advances, and that the whole profession and the world at large would benefit by the increase of knowledge thus brought about.

Dr. Groves (Isle of Wight) proposed a vote of thanks to the Treasurer and the Auditors. It was the greatest pleasure at any time to thank Dr. Campbell for what he did for the Society, and it was satisfactory to know that it was absolutely solvent. Members could not be too grateful to the Treasurer and Auditors for their work.

Dr. Campbell Thomson seconded the vote, and it was unanimously carried.

Dr. Harry Campbell (Treasurer) expressed his grateful acknowledgments.

Dr. Pope (Leicester) proposed a vote of thanks to the Council and the Secretaries, the latter of whom he regarded as the most important of the Society's officers. He stood there as the representative of one of the worst climates of the country, and therefore might be regarded as an *advocatus diaboli*. He felt much indebted to the Council and Officers for their wise regulation of the affairs and methods of the

Society, and, judging from the production of the Journal, for the happy way in which they focussed what should be the views on the subjects dealt with. Personally, he represented rather the supply of patients to balneological and climatological centres than a locality which catered for them.

Dr. ARTHUR THOMAS (Boscombe) seconded the motion with great pleasure, especially as it was connected with Dr. Sunderland, who had been a great help from the commencement of the Society.

Dr. WARD HUMPHREYS acknowledged the vote on behalf of the Council, and agreed with all that had been said about Dr. Sunderland. Of all the people who had worked hard for the Society Dr. Sunderland took first place; he was unwearying in his efforts and invariably courteous; and all his spare moments were spent in looking after the Society, and in inducing his co-editor to do his duty.

Dr. SUNDERLAND very briefly acknowledged the vote, remarking that Dr. Shirley Jones should be asked to reply.

Dr. H. SHIRLEY JONES (Droitwich) said he thought the proper person to respond to the kind vote of thanks was Dr. Sunderland, bearing in mind the very large proportion of work which he did. Still, on behalf of his colleague and himself he cordially thanked the Society for their kind resolution.

THANKS TO THE EDITORS AND LIBRARIAN.

Dr. DOUGLAS KERR (Bath), in proposing that the thanks of the Society be accorded to the Librarian, said: The relation of the Editors to the Society was similar to that of the Press to Members of Parliament; it was said there would be very little talking if the speeches were not reported. He did not say members would not meet and discuss subjects if the speeches were not reproduced, but it was a pleasure to know that the Editors looked after the Society's interests in that respect. From the knowledge that was derived from

the excellent volumes which were served periodically he was sure the vote of thanks to the Editors would be well received by the Fellows. The duties of the Librarian were not so onerous, but what he did was accomplished thoroughly well.

Mr. KEETLEY (London) seconded the motion with a very great deal of pleasure. It was not a mere figure of speech; it was the expression of his sincere feeling. He thoroughly enjoyed the reading of the Journal, which was most skilfully and ably edited. Miserable people, like himself, who had to live in a fog-laden atmosphere, instead of the delightful climates which most of the members enjoyed themselves in, could settle down by the fireside and fancy they were getting the benefit of the sea air. In a few minutes one could go from the bracing atmosphere over clay to the more soothing atmosphere of the gravel. As to the Librarian, the Society owed him very sincere thanks, because he had onerous duties to perform, which were well and punctually performed.

The resolution was carried.

Dr. LEONARD WILLIAMS replied, thanking the members for their kindness. He said the Editors of the Journal had the greatest pleasure in the world in receiving and even reading the majority of the communications submitted to them. Some articles received, however, had a distinct political note, and these had to be consigned to the flames. Members who, like a friend on his left, had deserted the medical for the political platform sent articles clothed, as it were, in the language of balneology, but concealed beneath were the wolves of political and fiscal agitations. Those gave great trouble, and he was sure the Society would be grateful to the Editors for denying them publication. He was not aware that the Librarian read the books; they were housed with Messrs. Bale, Sons and Danielsson, and those members who wished to consult books in that establishment would not be likely to do so on a second occasion, for the noise of the printing constituted a very trying ordeal to sensitive nerves. Still, he was glad it had not prejudicially affected the health of the esteemed Librarian.

Ordinary Meeting.

The President, Dr. Alfred F. Street (Westgate-on-Sea), in the Chair.

The President delivered his address on "Some Questions in Seaside Climatology."

Vote of Thanks to President for Address.

Dr. Leonard Williams said it was his privilege to propose a hearty vote of thanks to the President for his very admirable address. When Dr. Symes Thompson vacated the Chair he could honestly say he was heartily sorry for his successor, and when Dr. Street was elected to the Presidential Chair, in succession to Dr. Symes Thompson, his sympathies were with Dr. Street, because he felt how difficult it would be for anyone to fill that Chair with the grace and distinction which Dr. Symes Thompson had conferred upon it. But if anything were wanting to justify that choice, nothing could have done so in a more characteristic and certain way than the address just delivered. It teemed with thought and was pregnant with suggestion on precisely those matters with which the Society occupied itself. If anyone wished to understand the difficulties which surrounded the climatologist, or even the balneologist, the address would suffice to show that although the studies with which they were concerned were tentative, they yet had a sound scientific basis and deduction. He was glad to hear Dr. Street make his attack upon ozone. It had been an enemy of his own for a long time, but he had not had the courage and ability to attack it as Dr. Street had done. However, Dr. Street had succeeded in laying that spectre. But Dr. Street had not shown his usual courage in dealing with the question of humidity. He did not think any question of seaside climatology could be adequately dealt with apart from that of humidity; and though Dr. Street's reference to it was a tribute to his tact,

he would have liked to see it handled with a little more detail in what was otherwise so complete an address.

Dr. HAMILTON CUMMING (Torquay) seconded the resolution, which was heartily carried.

The PRESIDENT thanked the proposer and seconder, and the Society generally for the kind vote of thanks. He feared his address was really much more like a paper than an address; but, such as it was, it had afforded him great pleasure to prepare it, and still more pleasure to receive the Society's very kind acceptance of it.

BRITISH BALNEOLOGICAL AND CLIMATOLOGICAL SOCIETY.

COPY OF MINUTES.

Session commencing October 1, 1903.

GENERAL Meeting held at 20, Hanover Square, on Friday, October 30, 1903, at 8.30 p.m. The President, Dr. SYMES THOMPSON, in the Chair.

The minutes of the last meeting were read and confirmed.

The TREASURER (Dr. Harry Campbell) presented the balance sheet for the Session ending September 30, 1903. The balance sheet was received and adopted.

The retiring PRESIDENT (Dr. Symes Thompson) then introduced the President-elect (Dr. Alfred F. Street, M.A., M.D., B.C., D.P.H.Cantab., of Westgate-on-Sea), who then took the Chair and returned thanks for his election.

A vote of thanks to the retiring President was proposed by Dr. BAGSHAWE (St. Leonards), seconded by Dr. FELKIN (London), and carried by acclamation.

Dr. SYMES THOMPSON replied.

A vote of thanks to the Treasurer and Auditors was proposed by Dr. JOSEPH GROVES (Carisbrooke), seconded by

Dr. Campbell Thomson (London), and responded to by Dr. Harry Campbell, and by Dr. Snow (Bournemouth).

A vote of thanks to the Council and Secretaries was proposed by Dr. Pope (Leicester), seconded by Dr. Arthur Thomas (Boscombe), and responded to by Dr. Ward Humphreys, Dr. Sunderland and Dr. Shirley Jones (Droitwich).

A vote of thanks to the Editors of the Journal and the Librarian was proposed by Dr. Douglas Kerr (Bath), seconded by Mr. Keetley (London), and responded to by Dr. Leonard Williams.

Ordinary Meeting held at 20, Hanover Square, Friday, October 30, 1903, at 9.15 p.m. The President, Dr. Alfred Street (Westgate-on-Sea), in the Chair.

The following candidates were nominated for ballot at the ensuing meeting :—

Guthrie Rankin, M.D., F.R.C.P.Edin., M.R.C.P., London.
John Joseph Eyre, M.R.C.P., L.R.C.S.I., D.P.H., Rome.
James Mackenzie, M.D.Edin., M.B., C.M., Burnley.
John Thomas Haworth, L.R.C.P., L.R.C.S., Filey.
James Jordan Coleman, M.B., L.R.C.P., M.R.C.S., Bridlington.
Charles Edward Cormack, M.D.Paris, Vichy.
Arthur Cyril Bird, M.R.C.S., L.R.C.P., Sidmouth.
Wm. Edwyn Tinley, M.D., M.R.C.S., L.R.C.P., Whitby.

Dr. Street then delivered the presidential address, entitled "Some Questions in Seaside Climatology," which proved of great interest to the fellows.

Dr. Leonard Williams proposed, and Dr. Hamilton Cumming (Torquay) seconded, a vote of thanks to the President, who briefly replied.

Ordinary Meeting held at 20, Hanover Square, on Thursday, December 10, 1903, at 5.30 p.m. The President, Dr. Alfred Street (Westgate-on-Sea), in the Chair.

The following candidate was nominated for ballot at the ensuing meeting :—

Francis Jaffrey, F.R.C.S., L.R.C.P., London.

The following were elected Fellows of the Society :—

John Joseph Eyre, M.R.C.P., L.R.C.S.I., D.P.H., Rome.
James Mackenzie, M.D.Edin., M.B., C.M., Burnley.
John Thomas Haworth, L.R.C.P., L.R.C.S., Filey.
James Jordan Coleman, M.B., L.R.C.P., M.R.C.S., Bridlington.
Charles Edward Cormack, M.D.Paris, Vichy.
Arthur Cyril Bird, M.R.C.S., L.R.C.P., Sidmouth.
Wm. Edwyn Tinley, M.D., M.R.C.S., L.R.C.P., Whitby.
Guthrie Rankin, M.D., F.R.C.P., M.R.C.P., London.

Dr. Chalmers Watson (Edinburgh) read an interesting paper on "The Pathogenesis of Gout," illustrated by lantern slides.

The following took part in the discussion : The President, Drs. Sansom, Luff, Poynton, Parkes Weber, Leonard Williams, Douglas Kerr, Symes Thompson, Solly, Pardington.

Dr. Chalmers Watson replied.

Dr. Solly then read a "Note on Algiers," and showed lantern slides illustrating his paper.

Notes and News.

THE *Practitioner*, which in its new form has been in existence for exactly twelve months, has during that period succeeded in falsifying the forebodings of those who prophesied its speedy downfall as soon as Mr. Malcolm Morris vacated the editorial chair. Readers who appreciate the literary side of medical journalism will not have ceased to regret the disappearance of the Notes, under the title of "The Month," which used to enliven its pages from his ready pen. These notes, which were the productions at once of clear thinking and graceful writing, are a distinct loss to current medical literature, though one can readily believe that there may be those who regard the matter from another standpoint. To be attacked is never pleasant, but to live in the constant fear of an attack by a skilled swordsman must constitute a rather nerve-destroying discipline.

IN every other particular, however, the *Practitioner* maintains the high standard which we had become accustomed to associate with it, and the present editor is much to be congratulated on the very satisfactory manner in which he has performed the difficult task of succeeding so experienced and so resourceful a predecessor. The paper remains by far the best of the medical monthlies, a journal which is always well turned out and which contains most excellent matter for all classes of readers.

WITH the commencement of the present year we find another of the monthlies entering upon a new incarnation. This is the *Polyclinic*, the organ of the Medical Graduates'

College. This institution came very near to financial ruin in the course of last year, and in the opinion of many, this unsatisfactory state of matters was due mainly, if not entirely, to the lines on which the Journal had been managed. Not only was the money expended upon it out of all proportion to what was warranted by the income of the College, but its matter, so far from reflecting the admirable work which was, and is, being done in the College, was composed of articles on leprosy, cancer and arsenic to so great an extent as to satiate even those who took a particular interest in these subjects. We are far from regarding such matters as outside the scope of medical journalism, but we do feel that they should be relegated to their proper places—as for example, leprosy to the *Journal of Tropical Medicine*—and that even in their proper places some sense of proportion to other matters of equal importance should be cultivated.

THE new *Polyclinic* has entirely changed its form, possibly with a view of emphasising its root and branch dissociation from the principles and practice which had succeeded in rendering it so unpopular. It now appears in the shape of the *Clinical Journal*, on which indeed it seems to be modelled in more ways than one. Those who are familiar with the good paper and readable type of the latter will realise that an excellent prototype has been selected, and we are glad to see that a real and a conspicuously successful effort has been made to render the title page artistic. Medical journals are as a rule crudely and baldly dogmatic, but there seems to be no reason why their exteriors should not be made pleasing to the eye.

THE institution of which the Polyclinic Journal is the organ has also entered upon a new era. The financial difficulties above alluded to, which are now, happily, completely overcome, were responsible for many things in connection with the management of the College which caused some of

those who approved of the principle of the institution and who would under other circumstances have been its friends to decline any participation in its work. With the disappearance of the financial troubles has come an altered and improved scheme of management, and we are glad to believe that the London Medical Graduates College starts the New Year under auspices which afford every promise that it will henceforth take that position in the medical life not only of London but also of the Empire, to which its importance and its power of supplying needs undoubtedly entitle it.

AMONG the medical weeklies the *Clinical Journal* continues to hold a place which is entirely its own. It is not in any sense a medical newspaper. It does not enter into competition with the *Lancet* and the *British Medical Journal*, but contents itself with giving each week to its readers two or three admirable papers or lectures in which some particular subject is dealt with by an acknowledged authority. Its bulk is small and its appearance attractive. For those who are of necessity out of reach of large centres, there could be no better means of keeping abreast of recent work than a regular perusal of this well-conducted Journal.

THE members of Council of the Society have expended a great deal of thought and discussion upon the question as to whether it is practicable to hold one meeting annually at some place outside London. The point was first mooted when the Society was formed in 1896, and as no decision could then be arrived at the matter was allowed to drop. It has now been revived with considerable vigour, and the Council is anxious to obtain the views of those Fellows who are unfortunately unable to attend the meetings. The Secretaries will be glad to receive an expression of opinion by letter from each of the Fellows as soon as possible.

We are requested to call attention to the fact that the fourth French National Congress of Gynæcology, Obstetrics

and Pediatrics will this year take place in April, at Rouen. The sittings will begin on Tuesday, the 5th, and terminate on Sunday, the 10th. Having regard to the *entente cordiale,* coupled with the great accessibility of Rouen by the Newhaven and Dieppe route, the promoters are hoping that many English gynæcologists and general practitioners will be present and take part in the proceedings. From personal experiences of several such congresses in France, we can promise anyone who should take advantage of this opportunity, of combining profit and pleasure, a most cordial welcome from their *confrères.* The courteous and energetic secretary of the Congress, Dr. Albert Martin, 6, Place de la Cathédrale, Rouen, will be glad to furnish particulars and any information which may be desired.

Reviews and Notices of Books.

A System of Clinical Medicine, dealing with the Diagnosis, Prognosis, and Treatment of Disease, for Students and Practitioners. By Thomas D. Savill, M.D.Lond. (London: J. and R. Churchill, 1903.) Vol. i.

This book is so full of merits that a reviewer can afford to begin by dealing with such defects as seem to have emerged during the course of a careful perusal of its pages. And the first of these is suggested by a contemplation of the title itself. The manner in which the diagnosis and prognosis of disease is dealt with is not only adequate, it is actually, according to our present knowledge, exhaustive, but the same cannot be said for the department of treatment. We feel that the author has, in more ways than one, set up for himself a standard so high that he was in a measure foredoomed to failure, and certainly, if the therapeutical element had been frankly omitted, the book would have gained not only in simplicity, but, paradoxical as it may seem, in completeness also; for it is not to the advantage of a work to offer a promise which in the very nature of things can only find a very partial fulfilment.

The hints on treatment which appear are perfectly sound, and in many cases are very helpful, but, as being below the level of the rest of the work, and as being in reality outside its scope, we think that it would be well in another edition to omit them altogether.

Two further grumbles we are disposed to indulge in. One is the use of abbreviations, such as R.M. for respiratory murmur; the other is the system of cross references. With regard to the first, it must be admitted that it not only has the sanction of usage, but that it is a great convenience to the writer of a work of this scope and nature; but we have felt very strongly during our perusal that these considerations are not sufficient to recommend the abbreviations to the impatient and unaccustomed readers to whom the author is in the main addressing himself. In the matter of cross references we plead guilty to a prejudice in thinking that the repetition of a fact or a series of facts is infinitely preferable to a system which entails the looking backwards or forwards for illuminating points. But while in no wise modifying our general view

on the matter we are bound to confess that cross references being of the essence of the scheme of the book, it would have been impossible to avoid them in this instance. Their existence therefore does not commend the scheme to our judgment, but we nevertheless gratefully acknowledge that, granting the necessity for their existence, they have, by the arrangement adopted, been rendered as little irritating as the circumstances permitted. The author would probably be the first to admit that the scheme, being a new departure, a fresh venture in medical literature, is unlikely to be wholly free from objections, and though we are far from sharing the opinion of the Prime Minister that it is better to do a stupid thing which has been done before, than to attempt an intelligent one which has not the sanction of experience, we feel it to be right that everything new should have its disadvantages, no less than its merits, freely exposed.

To a proper comprehension of this book, a study of the introduction, in which its plan is unfolded, is essential, and the introduction will repay study, not only on account of the light which it sheds on succeeding pages, but as affording in its closing paragraph an example of surely the most graceful and whole-hearted tribute to the value of the labours of a fellow-worker and co-operator to be found in all medical literature.

With the above-mentioned reservations we feel that we can afford to extend to the book an unqualified welcome. The matter is all that it should be. It states facts and avoids contentious theories; and what is even more important, it states, in connection with a particular subject, all the facts which a student can reasonably be expected to know, and many which no examiner would expect from him. The manner also is beyond exception. It is plain, straightforward lucid dogmatism, unencumbered both by rhetorical effort and by crudity of style which constitute respectively the Scylla and Charybdis of scientific writing.

Dr. Savill is therefore to be congratulated upon the result of his present labours, which are in our opinion sufficiently meritorious to cause us to await with a considerable degree of impatience the volume which is to complete the work. If he can deal with neurology and dermatology in the same lucid manner as he has dealt with the other branches of medicine, the author has it in his power to confer a real boon upon coming generations of students.

No notice of this book would be complete which failed to include a word of appreciation of the excellent manner in which the publishers have carried out what the Americans would call their "end" of the transaction. The style and

make-up of the book are eminently suited to the purposes which the author has evidently had in view.

THE ERRORS OF ACCOMMODATION AND THE REFRACTION OF THE EYE AND THEIR TREATMENT. By Ernest Clarke, F.R.C.S., B.S.Lond. (London: Baillière, Tindall and Cox, 1903.)

It has always seemed to us a strange thing that general practitioners as a rule should be content with so meagre an acquaintance with the subject of which this book treats. When we consider that errors of refraction are so common and their correction for the most part so easy, it is astonishing that the majority of members of the profession should neglect a branch of knowledge and a sphere of skill whose study and practice is so interesting in itself, and, when properly carried out, is a source of so much satisfaction to the patient and consequently of so much credit to the practitioner. The refinements of refractive work, such as the correction of mixed astigmatism, is, and must always remain, a department of special expert work, but the correction of simple myopia, hypermetropia and presbyopia is by no means the difficult matter which many suppose it to be. The thriving trade which is carried on by opticians, optologists and other people who are wholly innocent of medical knowledge shows clearly enough, not only that there are numberless people who suffer from such errors, but that the prescription of the appropriate means for their relief cannot demand any very special gifts or any very laborious training.

The author of this book appears to have realised this aspect of the present position of ophthalmology among practitioners and students. He seems to say in effect "I present you with the essentials of refraction, the principles which underlie its theory and the technique of its practice. If you will master these, you will be the gainer in several ways. First, you will have a new interest in your daily work; secondly, you will learn how simple a thing is the correction of many of the errors which abound, and, inferentially, what you may undertake with credit to yourself and what is best left to the expert. Finally, you will make the optician your servant, which is what he ought to be, instead of, as he now too frequently is, your rival, or indeed your master." The book fulfils quite admirably the special and limited object which the author thus seems to us to be aiming at. It is thoroughly sound and up-to-date; it is not too long and not too recondite. The style exhibits those merits of simplicity and lucidity which are essential to exposition and

explanation, and the illustrations and diagrams are in keeping with the style.

The aspect of eye-work which we have endeavoured to indicate we cordially recommend to the notice of our readers, and we can say with confidence that in the study of these important matters it would be impossible to find a guide more reliable, or an exponent more lucid and instructive, than Mr. Ernest Clarke has shown himself, in these pages, to be.

Obituary.

THE death of Dr. John Ivor Murray took place at his residence, 58, Addison Mansions, Kensington, W., at the age of 78, on July 24 last. The deceased was one of the oldest and most valued Fellows of the Balneological Society.

Dr. Ivor Murray was born at Lasswade, near Edinburgh, on September 26, 1824, being the second son of the late John Murray, W.S. Law Agent to the Church of Scotland, an office which had been held by the family for four succeeding generations. His early education was received under the late Adolph Monod, at the Lycée St. Louis in Paris. At the age of 17 he returned to Edinburgh and studied Medicine at the University, where he had a distinguished career, taking the medals for Botany, Medical Jurisprudence and Midwifery, the latter being presented by Professor, afterwards Sir James Y. Simpson, and in 1844 he gained as a prize in the Class of Military Surgery, a Commission as Assistant Surgeon in the Army for the best account of the Contents of the Military Surgery Museum, a work which was published and used by Sir John Hall and other Medical Officers in the Crimean War.

As there was no vacancy at the time, Dr. Murray proceeded to China. After an adventurous journey, in the course of which he visited Borneo, he arrived at Canton, where he was placed in charge of the hospital during the *emeute* and attack on the European factories in 1846. From Canton he proceeded to Shanghai and built in 1852, at his own cost, the first hospital for Europeans north of Hong Kong.

While in China he collected, sent home and presented to the museums of this country, valuable contributions of natural history and "signally enriched" at least one, namely the Industrial Museum of Scotland. When the Crimean War broke out, and surgeons were badly wanted, he went direct from China to the camp at Sebastopol and reported himself to Sir John Hall for service, was appointed and gazetted 2nd Class Staff Surgeon, and served during 1855 and 1856 to the end of the war, as second in Charge of the General Hospital at Balaclava

and received the Crimean Medal and Sebastopol Clasp and the Turkish Medal.

On returning to England in 1856 he took the degree of M.D. at his old University and was admitted to the Fellowship of the Royal College of Surgeons of Edinburgh. Dr. Murray was selected by the Foreign Office to accompany the late Lord Elgin on his Embassy to Pekin, but owing to the breaking out of the Indian Mutiny, and diversion of the troops to India, his services not being then required, he took up his appointment as Colonial Surgeon at Hong Kong. He held the office of Colonial Surgeon at Hong Kong from 1858 to 1872, during which time many important improvements in the sanitary condition of the colony were carried out by his advice under the administration of Governor Sir Hercules Robinson; such as an efficient water supply, proper drainage, and the working of the contagious diseases ordinance. The European mortality was reduced from 7·52 to 2·92 per cent. in these twelve years. By this able Governor he was appointed Inspector of Hospitals in 1868, with the satisfactory results recorded by the Medical Officers of H.M.'s Naval and Army Services and those of other nations. During his Colonial Surgeoncy he received from King Victor Emanuel of Italy in 1867, and from King Carl XV. of Sweden in 1868, the Order of Merit of the First Class for assistance rendered to Scientific Expeditions sent by them to China, and the thanks of the Imperial and Royal Academy of Science of Vienna for similar services.

In 1859, while in Japan, he was asked by H.M.'s Consul to assist him and the Japanese authorities to select a site for the British Settlement and selected that on which now stands the Town of Yokohama.

In 1872 he finally returned to England and, after a few years as consultant in London, removed in 1875 to Scarborough, owing to pecuniary losses, and continued there in active practice till 1900, when he retired to London. He was an enthusiastic Mason, being Senior Warden of the Grand Lodge of the N. and E. Ridings of Yorkshire, and also Master of the Denison Lodge, Scarborough, and Master of

the Zetland Lodge, Hong Kong. He married, in 1861, the daughter of Dr. Alexander, of Wooler (who survives him) and leaves two daughters and four sons, two of whom are in the profession, one, Dr. Gawler Murray, having succeeded him in his practice at Scarborough.

Dr. Ivor Murray's connection with the Balneological Society came late in life, but in his case age had by no means abated his natural force, and indeed, gave an added value to his presence on the Council. For several years his wide experience and sound judgment were freely placed at its disposal. In 1898 he was elected to the Presidency of the Society, in succession to the late Dr. Sinclair Coghill, who had also, like many of our Fellows, been connected with the Far East. They had been friends together in China, and it is interesting to reflect that Dr. Murray's span of active life just covers that wonderful period of evolution in which Japan awoke from the sleepy "cycles of Cathay." His life and work as a medical pioneer connect the old Asia with the new.

In his presidential address, entitled "A Retrospect and a Forecast," he enumerated the astonishing improvements in medical and surgical practice in his own experience, and predicted that hygienic means, water, baths, climatic influences, and the health resorts of our own country, would more and more be relied upon in the treatment of chronic disorders. Dr. Murray contributed on other occasions admirable papers on "Scarborough" and "Hayling Island" as health resorts, considering it no less than the duty of medical men cognisant of the therapeutic capacities of different localities to make the facts known to their professional brethren.

Dr. Murray will be long missed from the meetings of the Balneological Society. The enthusiasm of a veteran sometimes puts younger men to shame and teaches how precious is the use of opportunity. May his honourable record, his northern energy, his unassuming manner, and his gentle kindliness, long remain a model and a memory in our midst.

THE JOURNAL

OF

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BRITISH BALNEOLOGICAL AND CLIMATOLOGICAL SOCIETY.

THURSDAY, DECEMBER 10, 1903.

OBSERVATIONS ON THE PATHOGENESIS OF GOUT.*

BY CHALMERS WATSON, M.B., F.R.C.P.E.

Physician, Eye, Ear and Throat Department, Marshall Street Dispensary, Edinburgh.

PRIOR to Garrod's great discovery of the presence of uric acid in the blood in gout (1847), some authorities expressed the opinion that a derangement of the intestinal tract was the primary factor in the disease. This view was expressed by Van Swieten (1255 A.D.) in the following terms: "Indigestio viscorum pro origine proxima hujus morbi habetur." Since 1847 this theory has been abandoned, and in the writings of Garrod (1876), Duckworth (1889), Ewart (1896), Roberts (1897), and Luff (1898), the possibility of gout being due to an intestinal auto-intoxication or infection is never considered. In 1901 the writer revived this old-time theory in the following terms: "(*a*) There is ample evidence to prove that the uric acid in the blood is not the primary factor in gout, and (*b*) uric acid can be deposited in cartilages and

* Since the above was written my attention has been drawn to an admirable paper by Gore (*British Medical Journal*, 1900, ii., p. 898), in which the same opinion is clearly expressed.

7

other tissues even in considerable amount, without the association of any inflammatory phenomena. (1) The last-mentioned point clearly proves that uric acid is not the factor which causes the inflammatory phenomena characteristic of the acute attack; (2) what, then, are the toxic principles in the blood which possess the power of inducing the characteristic inflammation? and (3) what are the factors which determine the passage of these toxic substances from the blood into the tissues? In connection with these queries we have to consider the all-important part played by the alimentary canal. Here we have, doubtless, one of the important keys to the solution of the problem.''[1]

Evidence for or against this theory is difficult to obtain from the human subject, and it is therefore advisable to have recourse to the study of the comparative pathology of the disease. Gout is a rare occurrence in the lower animals. The literature of the subject contains references to isolated records of the occurrence of uratic deposits in the tissues of lower animals, mainly wild animals in captivity, but detailed histological records are wanting. As an indication of the rarity of the disease in poultry, I may say that some years ago the writer obtained the assistance of the editors of leading poultry journals in his quest for ''gouty fowls.''

A considerable amount of pathological material was forthcoming; this comprised fowls which had died from tuberculosis, fowls which had been affected with swollen joints, others with large chronic inflammatory swellings of the feet, and fowls that had succumbed to disease unaccompanied by any lesions in the limbs which were visible *post mortem*. In no single instance was there any indication of uratic deposit in or about the joints, or in any of the tissues of the dead animals. Three years ago, however, I was fortunate enough to secure one typical case of gout in a fowl (cock). The animal was a year old, and was bred on the farm from which it was sent to me. The clinical record shows that the fowl was observed to be out of sorts for a few days, its comb became dusky, and it was found dead.

FIG. 1.—Gout in fowl. Liver. (Note the distension and thrombosis of the veins and the congestion of the organ.)

FIG. 2.—Gout in fowl. Small intestine. The mucous membrane shows (*a*) diminution in the glandular elements; (*b*) increased amount of lymphoid tissue; and (*c*) catarrhal exudation on the free surface.

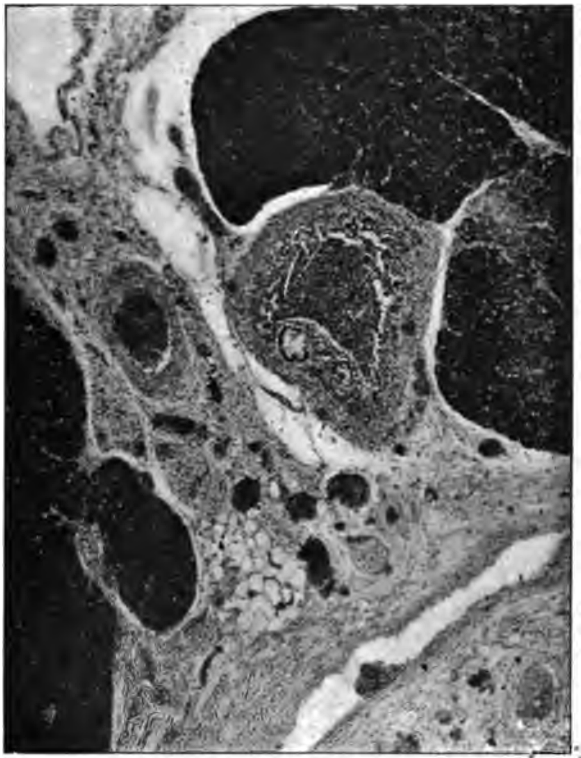

Fig. 3.—Gout in fowl. Pancreas. Transverse section at the hilum. The lumen of the duct is filled by catarrhal cells derived from the inflamed mucous membrane; the vessels in the wall of the duct and around are congested.

The present paper is a record of the *post-mortem* appearances of the case. Particular attention is directed to the histological appearances of the kidneys, pancreas, intestine and tissues generally, the lesions described being regarded as characteristic of the invasion of the tissues by bacteria or their products. The facts recorded have a bearing on present theories regarding the disease, more especially the well-known views of Ebstein, but the consideration of this point is beyond the scope of the present paper.

Necropsy.

(1) The synovia in some joints was of the colour and consistence of cream; this readily gave the murexide reaction. When this creamy layer was washed off there was no visible lesion of the articular or other structures of the joints.

(2) A deposit of sodium urate in some extra-articular tissues, mainly in relation to the smaller joints. This was specially abundant in relation to tendons, several of which were completely necrosed. Microscopic sections of these tendons, which were treated by the addition of weak hydrochloric acid, showed copious deposits of uric acid crystals. The murexide reaction was readily obtained.

(3) The heart showed early pericarditis, a fine layer of fibrinous exudation being present at the base of the organ. Microscopic examination showed pronounced distension of and a quantity of fibrin in the subepicardial veins.

(4) Widespread thrombosis, notably in the vessels of the liver, lungs, kidneys and some large abdominal veins. The distension and thrombosis of veins in the liver is shown in fig. 1. The appearances at the necropsy appeared to indicate that this thrombosis was the immediate cause of death.

(5) Marked congestion of the liver, lungs and kidney. Microscopic examination of the liver showed some atrophy of the liver cells. The congestion of the liver is indicated in fig. 1.

(6) Areas of necrosis in the kidneys. Scattered throughout the organ there were numerous areas of necrosis (see

fig. 5), which varied in size from the head of a pin up to a small bean; these presented a white amorphous appearance quite distinct from the rest of the organ. The cortex was markedly congested (see fig. 5). The histological characters of the kidney are described later.

A microscopic examination was made of the foregoing and other tissues—namely, intestinal tract, pancreas, lymphatic glands, spleen, sciatic arteries and nerves, skin, comb, and testicle, the tissues of a healthy fowl of the same age being used for comparisons. The bone marrow was not available for examination. The following morbid appearances were found :—

(*a*) Catarrh of the intestine, especially in the ileum, duodenum, and large intestine. This was of a patchy nature in the upper part of the tract, but was continuous and pronounced in the lower end of the ileum. The capillaries were markedly dilated, apparently due to a condition of venous stasis. There was a great excess of lymphoid tissue in the ileum.

Fig. 2 shows a loss of glandular structures with a separation of the glandular elements by excess of interglandular tissue, and a catarrhal exudation lying on the free surface.

(*b*) The pancreatic duct was filled by catarrhal products derived from their lining membrane. This is well seen in a transverse section of the gland at the hilum (see fig. 3) and also in a longitudinal section (see fig. 4). The vessels in the wall of the duct were much distended, and also the vessels around (see fig. 3).

(*c*) The spleen showed congestion, the endothelial cells of the sinuses were proliferated, and there was a marked increase in the number of granular leucocytes in the capillaries and sinuses as compared with the control sections.

These features are the characteristic reaction of this organ to invasion by bacteria or their products.

(*d*) A lymphatic gland showed a minute crystalline deposit of urate of soda surrounded by a few small round and epithelial cells.

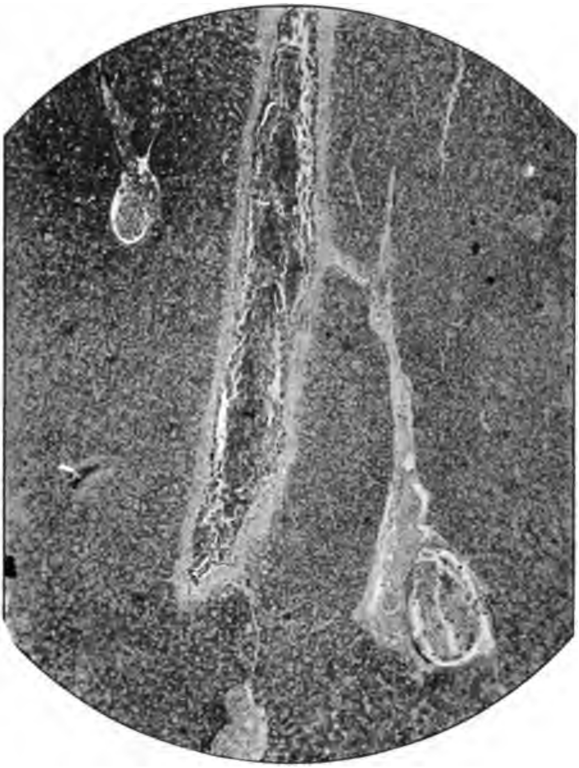

FIG. 4.—Gout in fowl. Pancreas. Longitudinal section. (Note the blocking of the lumen of the duct by catarrhal products.)

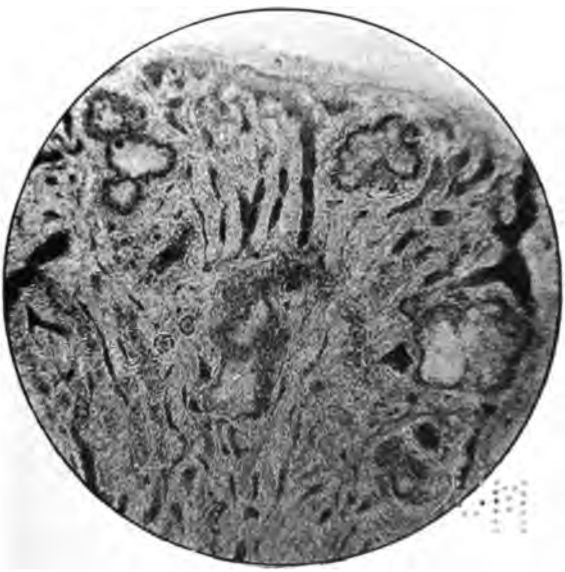

FIG. 5.—Gout in fowl. Kidney cortex. (Observe the areas of necrosis [see text] and the congestion of the organ.)

This point is of interest in connection with views previously held as to the involvement of lymphatic glands in cases of gout. In his well-known work, Duckworth states that "the lymphatic system has been held to be free from any changes in gout. The glandular portion cannot be said to be involved, but there is clinical evidence of subacute gouty inflammation of lymph spaces in certain organs due to uratic deposit and influence. Dr. Buzzard has called attention to this."

(*e*) The kidneys. Fig. 5 shows the appearance of the cortex of the kidneys under a magnification of 20 diameters. Note four necrotic areas in the field. These present a whitish colour, and are surrounded by a dark ring which consists of small round cells of an inflammatory nature. The small dark points visible in the centre of the areas are granular leucocytes which have invaded the necrosed areas. In fowls those leucocytes are large and possess very coarse "crystalline" granules. The dark bands in the figure are congested blood-vessels. Under a magnification of 600 diameters with ordinary stains, for example, hæmatoxylin, eosin, and methyl blue, these necrotic areas presented a structureless homogenous appearance. An examination of smaller and earlier nodules revealed at parts a considerable amount of crystalline deposit of sodium urate surrounded by inflammatory tissue. It was not possible for me to express a definite opinion as to whether their original starting point was in the tubules or in the intertubular tissue. The arrangement of these smaller areas alongside the interlobular arteries suggested an infection by the blood stream.

Mr. Richard Muir, of the Pathological Department of the University, kindly made a bacteriological examination of the sections, the methods employed being (1) the ordinary basic stains, and (2) a modification of Benda's stain. The former gave negative results, the necrosed areas presenting a structureless hyaline appearance; the latter method of staining demonstrated that the tissue in the necrotic areas was not structureless, as was indicated by the ordinary staining

methods. The tissue consisted of rod-like bodies of the size of large bacilli massed together in dense clusters; the appearance suggested that these rods were either degenerated cell products of an unusual character, degenerated bacteria, or crystalline in nature.

An examination with a polariscope, kindly made for me by Dr. Marshall, of the Chemistry Department of the University, clearly indicates that they were not crystalline. We therefore conclude that the rods in question are either the products of degenerated cells or bacteria which had lost their affinity for ordinary bacterial stains, owing to bacteriolytic or other changes. The appearances generally are in favour of the latter view. It is, however, right to indicate that an examination of the earlier areas failed to show any bacteria; and, further, that an examination of a necrosed tendon by the same method (modified Benda) did not reveal a similar appearance. In the deeper part of the cortex and in the medulla a very striking pathological condition was present in the collecting tubules. These were everywhere markedly dilated and filled with granular leucocytes. This appearance is well shown in fig. 6, in which the dark bands are collecting tubules. For the sake of clearness the vessels have been blocked out of this and the subsequent figure. These granular cells can be seen emigrating from surrounding capillaries through the walls of the collecting tubules. The renal blood-vessels contained a marked excess of these blood constituents. This condition of the collecting tubules is also indicated in fig. 7, which shows in addition the following features:—

(*a*) The presence of granular leucocytes lying free in the intertubular tissue.

(*b*) An atrophy of the epithelial lining of the convoluted tubules, doubtless due to pressure of the leucocyte exudation.

(*c*) Several convoluted tubules which appear perfectly normal.

A transverse section of the ureter in the same section from which fig. 6 was taken shows that the leucocytes had undergone marked degeneration in the course of their downward

FIG. 6.—Gout in fowl. Kidney at junction of cortex and medulla. The dark bands are dilated collecting tubules full of granular leucocytes. The blood-vessels have been blocked out of the section.

FIG. 7.—Gout in fowl. Kidney at deep part of the cortex. (Note [1] the collecting tubules full of granular leucocytes, with atrophy of the epithelial lining; [2] several convoluted tubules which appear perfectly normal. The blood-vessels have been blocked out of the section and appear white. See also fig. 6.)

journey, very few leucocytes being present as such in the ureter.

The gouty deposit in the tissues, the changes in the synovia, the widespread thromboses, and the areas of necroses in the kidney clearly indicate the nature of the disease. It is a typical case of gout. It is furthermore a case of acute gout which had proceeded to its natural termination. The fact that early indications of pericarditis were present might suggest the opinion that the animal, undoubtedly the subject of gout, succumbed to some terminal infection not immediately related to the gouty disorder. The clinical history and pathological appearances alike fail to substantiate this view. In this connection reference may be made to the—

(1) Absence of any alteration in the joint structures other than in the synovia, the nutritive fluid of the joint. There was no gouty arthritis nor other indication of chronic disease.

(2) The absence of any cirrhotic changes in the kidney and fibrous overgrowth in relation to the deposits in the extra-articular tissues such as we would expect in chronic disease.

(3) The blood-vessels of the animal were singularly healthy, which in all probability would not have been in a case of chronic disease that had succumbed to what is commonly known as a terminal infection.

These negative facts fail to substantiate this hypothetical view as to the existence in this fowl of two or more diseases not etiologically related, and this failure is emphasised by reference to some of the other unusual features of this case, more especially to the condition of the pancreas and collecting tubules of the kidney, both of which present pronounced morbid appearances of a character extremely rare in the history of simple terminal infection. We are therefore driven to the conclusion that we have to deal with a case of pure gout in which the disease had run a natural course, in which an examination of the tissues shows that the *post-mortem* appearances generally are characteristic of an infection by bacteria or their products.

Particular interest centres in the condition of the intestinal

tract, pancreas and kidneys. The condition of the pancreatic duct is a very striking one; it appeared to be an extension from the duodenum. A reference to the figures shows that the lesion would be in its results analogous to the effect of a ligature of the duct. The interesting question is raised as to the existence of any relationship between these appearances and the occurrence of gouty glycosuria in the human subject. The changes in the tubules of the kidney are remarkable. I am not aware that these appearances have been previously described. The alterations in the leucocytes have a special interest in connection with the changes in the blood in acute polyarticular gout recently described by the author,[2] and confirmed by Bain.[3]

The main facts learned from this investigation emphasise the necessity of further examination into the comparative pathology of the disease. It is specially important to obtain material sufficiently fresh to allow of an adequate bacteriological investigation. A question that at once presents itself from the foregoing record is, how would the acceptance of the theory of a bacterial origin of the disease harmonise with the known clinical facts of the disorder? The consideration of this point is not relevant to this communication. It may, however, be stated that in my opinion the clinical features of gout—regular or irregular, acute or chronic—are more adequately explained by the light of our present knowledge of infections, relapses, and immunity than by any other theory. The distinctive feature of the infection in gout is that the toxin or toxins have the special property of disturbing nitrogenous metabolism in a manner favourable to the deposit of uric acid in certain tissues.

In conclusion, I would only add that the addition of a bacterial factor to our present conception of the disease would in no way minimise the importance of attention to dietetics in its treatment. It would correct the teaching of some writers whose standard of dietary has special reference to nuclein-holding foods, and would focus attention on the by-products of deranged digestion of carbohydrates and

proteids arising from abnormal bacterial activity in the digestive tract and other tissues.

REFERENCES.

[1] "Encyclopædia Medica," vol. iv., article "Gout."
[2] *British Medical Journal*, January 6, 1900.
[3] *Ibid.*, January 31, 1903.

DISCUSSION.

The PRESIDENT said members must not only feel grateful to Dr. Chalmers Watson for the interesting and suggestive paper which he had read to them, but also admiration for the amount of labour exidently expended upon it. The sections and slides which he had shown in such profusion must have taken very many hours to prepare. The contribution bristled with subjects for discussion, and he hoped there would be a good debate.

Dr. A. E. SANSOM said he came to learn, and had done so; and he thought it their duty, as a Society, to thank the author for the instruction he had imparted—instruction which was sadly needed. The pathology, pathogeny and clinical history of gout constituted a very difficult question, and the author had provided much food for reflection, even if he had not convinced. There was first the behaviour of the large animal, and secondly the behaviour of its tissues. The clinical history taught much; but the sectioning of specimens of tissues and *post-mortem* evidence yielded facts of the highest importance. He did not think one could adopt any speculative ideas or philosophy on the matter; the facts must be allowed to permeate into the understanding. The clinical history tallied admirably with what one knew about gout already, and it provided in the behaviour of the animal *in toto*, a standard to go by. The condition artificially induced in those animals was very much like the gouty paroxysms, or at any rate the gouty perversion of metabolism shown in man, though he did not say that it was identical. The microscopical preparations exhibited by the author were most beautiful and valuable. Observa-

tions of clinicians seemed to show that there was a difference between an acute paroxysm of gout and the goutiness which was so frequently seen in one's patients. The observations of the author were on acute cases; but he acknowledged that they recovered, and that there were repetitions of the process. The points he would suggest for further enquiry were as follows: Whether, after all, there was not a neuro-pathology for gout which had yet to be fathomed. He believed Sir Dyce Duckworth held that there was such a neuro-pathology. It was a question of the neuritis produced by the toxins, for they were toxins; and whether they were the direct effect of perverted metabolism or the indirect effect of something else co-operating with it. That would be a subject for further investigation and thought; but it seemed a likely explanation that the first influence was upon the nerve mechanism, possibly the vaso-motor system, or upon what might be called the chemical centres; for there were portions of the intricate nervous system which governed the processes of metabolism. At any rate, the effect upon organs, especially the kidneys, had been exceedingly well worked out in the contribution of Dr. Chalmers Watson. Once perverted metabolism occurred various other conditions followed. He (Dr. Sansom) did not believe that uric acid would explain everything; it was something which went with the uric acid that did the most harm. It was perverted metabolism certainly, but so was phosphaturia. He did not know that one was not right in saying that the first step in the gouty paroxysm was a nerve step, and that the subsequent steps were organic lesions, produced in the way the author had indicated.

Dr. Luff cordially added his testimony to the beauty of the slides shown by Dr. Chalmers Watson, and the very great amount of work he had devoted, not only to the preparation of those specimens, but also to the preparation of the view of the subject which he had just placed before the Society. He (Dr. Luff), however, felt somewhat at a loss in discussing the pathogeny of gout from what had been

said, because he was not at all sure that the beautiful specimens shown were really from cases of gout. In the first of the specimens the author said they were from a case of gout naturally acquired; but one was not told in what way the fowl acquired it. He (Dr. Luff) had been shown, and had investigated, a number of birds which were reported to have had gout; but in a large number of them he found that the condition was not gout at all. Birds were liable, especially in the toes and feet, to tuberculous deposits, and in those deposits of sodium biurate sometimes occurred. That was not to be wondered at when one considered that the excretions of birds' kidneys were composed entirely of uric acid compounds. Therefore, it was not unlikely that such uratic deposits would occur in any abnormal growth or accretion which might arise in birds. So he would not be convinced that because sodium biurate deposits were found in some of the specimens it was evidence that the fowl was suffering from gout. With regard to the feeding of the birds in connection with the other series of experiments, he did not see that Dr. Chalmers Watson had induced gout at all; he had thoroughly poisoned those birds with the altered produced of the proteids which he plied them with, and had produced a large number of pathological changes in the tissues. He failed to see that there was any production of gout. But in view of the very humane rule that a member should not address the Society longer than ten minutes—which he proposed to obey—he would address himself to the question which he was glad had been raised by Dr. Chalmers Watson as to the intestinal origin of gout. The point was connected chiefly with the first series of specimens shown representing the intestinal tract, and depicting what was undoubtedly a catarrhal and inflamed condition of that tract; but that was no more than existed in many other diseases than gout. Dr. Watson, in the epitome he circulated, stated that in 1901 the writer revived the view as to the derangement of the intestinal tract being the primary factor of the disease, and that that was elaborated in a future paper by Dr. Woods

Hutchinson. His (Dr. Luff's) attention had been drawn for the past four or five years, and with increasing force, to the view that the intestinal tract was a very powerful factor in the development of gout, and it might possibly be the primary factor. His attention was first drawn to that by certain clinical observations of his own, especially with regard to an attempt he was making to explain the action of colchicum in the gouty. Later on his attention was directed—prior to the time that Dr. Chalmers Watson claimed he revived the theory—to the subject by a very able paper that Dr. W. R. Gore read in the summer of 1900 at the meeting of the British Medical Association. It was an extremely able and suggestive paper ; but, for some reason, it neither received the attention nor the wide discussion that it deserved. He would read one brief extract from Dr. Gore's paper, which was contributed to that meeting. Dr. Gore said he considered that gout was caused by some product of digestion, either absorbed from the digestive tract, or produced by some alteration of metabolism going on in some of the digestive organs. There must be some body formed in the intestinal canal capable both of causing the symptoms of gout and also so altering the metabolism of the liver as to cause an increased formation of uric acid. Dr. Gore went on to state that he considered a toxin was the cause of the disease, a product of a definite bacillus, and a product of one of the bacilli normally found in the intestinal canal. So that there, a year previously, was exactly what Dr. Chalmers Watson was claiming that a year later he revived. As a peculiar coincidence, almost at the same time, *i.e.*, in the same summer, and only two or three weeks later, Dr. Le Gendre read a similar paper at the International Congress of Medicine in Paris, in which, although he did not go as far as Dr. Gore went in his views, yet he foreshadowed the possible intestinal origin of gout. Later on came one of the most instructive papers which he thought had been put before the profession, certainly for many years, by Dr. Woods Hutchinson, in the *Lancet* of January of this

year. He knew of no better review of the subject, nor of any better wording than that used by Dr. Hutchinson as to the absurdity, which he (Dr. Luff) had for a long time maintained, of the craze in connection with uric acid, the attributing to uric acid a great many of the ills of which it undoubtedly was not the cause, and in which it was only a kind of *debris* following upon those affections and diseases. Dr. Hutchinson, also, he was glad to see, decried the absurd laudation, the absurd idolatrous worship, of that harmless body uric acid—harmless, at all events, while it was in the circulation and in solution. He believed it was in no sense a toxic body, and on that point great stress was laid in the paper to which he was alluding. The author of that paper went further, and sketched what he considered was the primary cause of gout. Briefly put, his view was that gout was a toxæmia; that the source of the toxin was the gastro-intestinal tract; that owing to some catarrhal or inflamed condition of that tract, either secondary to, or else not secondary to some chemical changes within that tract, a toxin was produced, that that was absorbed into the circulation; that if the cells, either the wandering leucocytes of the blood and the lymph, or the fixed body cells, could successfully combat and neutralise that poison, nothing resulted. He thought probably that was the case in people who got certain intestinal derangements, which quickly passed off; but if the cells were powerless to completely neutralise that toxin, then, as the result of the unaltered toxin that was circulating in the blood and lymph, gout resulted; that the cells, lymphocytes, and fixed body cells which were able to neutralise part of that toxin, in neutralising it suffered degradation and degeneration, and as a result uric and phosphoric acid, the *debris* of neucleonic substances, were set free, and that that was the origin of uric acid which, in certain cases, might be deposited as an after-effect in the form of sodium biurate. That was the view clearly stated by Dr. Woods Hutchinson, and he (Dr. Luff) was prepared to state, as he had stated before, that his own views tended

in the same direction; that in all probability the origin of gout was from intestinal changes, and that the poison of gout was a body which produced uric acid merely as a by-product. Time would not allow of his referring to some of the observations which he had made on the action of colchicum.

The PRESIDENT said he felt sure the Society would agree to grant Dr. Luff an extension of time for his remarks.

This being agreed to:

Dr. LUFF (continuing) said that in that case he would refer to the action of colchicum. Many clinical workers had been very much interested in endeavouring to ascertain why colchicum was a specific for gout. It could not be denied that, given an acute case of gout, there was probably no drug which would compare with colchicum in the rapidity with which it would not only relieve the pain of the individual, but cause the attack to subside. He first studied the action of colchicum from the toxicological point of view. He happened to see some cases of acute colchicum poisoning—he would hasten to say not in his own practice; there were about four cases which he had seen in hospital practice, and two others which he had seen outside. He carefully studied the symptoms. To state the matter briefly, colchicum poisoning was almost precisely similar to acute arsenical poisoning in its effects. It was, first of all, mainly a gastro-intestinal irritant; it produced nausea, vomiting, choleraic diarrhœa, and rice-water stools, just as arsenical poisoning did. It also produced a similar cardiac depression, a bilateral neuritis (if continued in sufficient toxic doses), and therefore it seemed to him that, if it were pushed, colchicum behaved very much like arsenic. His observations on the drug were not yet completed, and therefore he could only give the crudest epitome. He made observations on the motions, noting not only the colour of them, but some of their chemical constituents, and his conclusion was that the action of colchicum was probably upon the gastro-intestinal canal. If that was so, then its rapid efficacy in cases of gout was possibly

due to its altering those intestinal changes which perhaps generated the toxic body which, when absorbed, caused the gouty attack.

One other point he wished to refer to, as it was a personal matter; but he would do so briefly, as it was not of very great importance. Dr. Chalmers Watson, referring to the view as to the intestinal cause of gout, said that in the writings of certain authors, himself (Dr. Luff) among them, the possibility of gout being due to an intestinal auto-intoxication or infection was never considered, and Dr. Watson gave the date of Dr. Luff's work as 1898. He knew of no reason why anyone, when criticising the work of any individual, should pick out any one particular writing, especially if that writing happened to be five or six years old. In basing his views and criticisms of that individual's opinions, why should he refer to only one published writing? Why should not subsequently expressed views receive their proper recognition and consideration? At a meeting of the Society held last April, when, at the request of the President, he reopened the discussion on the dietetic treatment at spas, he (Dr. Luff) referred to his views in connection with the causation of gout. His remarks were published in the *Lancet* of May 2, 1903, and were therefore available for anyone who wished to read them. He then distinctly stated as follows: "Gout I regard as a disease which is due to faulty metabolism; probably both intestinal and hepatic, as the result of which condition poisons are produced which lead to an auto-intoxication, which is an early factor in the development of the gouty condition. Certainly I think that with our increasing knowledge and experience uric acid and its salts will, in all probability, have to be relegated to a position of subsidiary importance in the pathogenesis of gout." In July of this year, *i.e.*, two or three months later, in a paper in the *Practitioner* on "The Treatment of Gout," prior to discussing the actual treatment, he referred to the same views, and said, further "This auto-intoxication coincides with, or is followed by, in the majority of cases, a disposition of sodium

biurate in certain joints and tissues, which constitutes the climax of the gouty attack. All the manifestations are probably dependent upon much more general and much larger conditions than a mere excess of uric acid in the blood. The deposition of sodium biurate is possibly merely a sign of the disease, and not the essence of it." Those views, which were published subsequently to 1898, clearly showed that he very much appreciated the view as to the intestinal origin of the toxin or toxins, which might initiate gout. He had been told that since the publication of the Goulstonian Lectures at the College of Physicians he must have changed his mind. Undoubtedly he had. He had never been ashamed to own that his mind was constantly changing. It was only admitting that one was wiser to-day than yesterday. He did not know, in regard to any individual, when he reached the acme of mental immutability. Certainly he had not. As an investigator and enquirer—and he hoped also as a practical physician—he was constantly changing his mind, and he trusted he would go on doing so to the end of his days.

Dr. POYNTON wished to support Dr. Chalmers Watson's generalisations to this extent: that it was most probable that a study of bacterial processes would throw light upon gout. A bacterial view of the pathogenesis of gout was no new idea. Various French writers had practically exhausted some ten years ago all the theoretical considerations which pointed in that direction. Now facts were needed. It was even in theory, in his opinion, a far better explanation of the disease than the "uric acid" theory, which in this country was really an "obsession." Facts that supported the view that a study of bacterial processes would throw light upon gout were the demonstrations of the bacterial origin of rheumatic fever by Dr. Paine and himself in 1900; the occurrence of renal lesions in rheumatism, which resembled those described in gout, and experimental production of chronic rheumatic arthritis and osteo-arthritis, which the same authors had demonstrated at the Chelsea Clinical

Society in 1900, and the Pathological Society in 1901. Again, in 1902, before the Royal Medico-Chirurgical Society they had demonstrated the powerful acid-producing properties of the rheumatic diplococcus ; and this was suggestive because some acid-producing process in rheumatism and gout had long been suspected. He recalled certain clinical facts in the occurrence of gout : the multiple arthritis, occasional pericarditis, phlebitis, angina faucium, chronic endocarditis, nephritis, nodules. Did not these remind us of rheumatic fever, and did not they clearly point to a study of bacterial processes as the real step to be made in gout ? Possibly other poisons than the bacterial might produce the same symptoms ; but this did not alter the fact that a study of bacterial poisons would be of much assistance.

It was highly necessary to keep distinct the gouty diathesis and the gouty paroxysm in researches of this nature. For his part he had no belief that biurate of soda was a mere precipitation from a supersaturated fluid, but thought it much more probably a precipitation which resulted from *local* morbid processes. Gall stones might have a bacterial nucleus, why not a tophus ? These morbid processes, he believed, were peculiar because they occurred in the tissues of the "gouty."

Dr. Leonard Williams added his thanks to those of previous speakers to Dr. Chalmers Watson for the very interesting facts which he had brought forward. He would confine his remarks to the latter part of the demonstration, to those rakish and dissipated-looking fowls which were projected on to the screen. He understood the first two fowls had joint affections, which were, to all appearances, gouty ; and that other fowls had been treated to a similar diet, but failed to develop the joint affections. From a climatological point of view he thought it was a matter of interest that although the experiments were repeated, so far as the author was able, the results were so different. He regarded that as an additional fact bearing upon one he had more than once referred to in the Society's meetings, viz., the

influence of climate upon diet, and the influence of diet upon the condition of the person in regard to the climate in which that person might find himself. It had been mentioned on several occasions that the Scotch did not have gout. It could not be because they did not drink alcohol, nor because they did not eat meat. Some of them did not eat much meat, but they made up for it by eating porridge, which was very rich in nitrogenous elements; so that their immunity from gout was probably due as much to climatic as to dietetic causes. The influence of climate in determining the particular manifestations of certain diseases was a very interesting matter. Another point of interest about the birds shown was, that the diet had at any rate been productive of great disturbances in the skin. Members of that Society claimed that one of the proper ways in which to treat chronic gout was by balneological processes, which were merely processes directed to the eliminating function of the skin. And although one did not at present know exactly what those functions comprised, it was clear that they did not consist merely of those described in the text-books. It was mentioned in a text-book that some unfortunate boy was covered with gold leaf, and that he died in consequence. It was evident that the boy would not have died had it not been for the fact that he was unable to eliminate certain toxins which were in his blood. Undoubtedly the skin was an eliminative organ of far greater importance than it was usually thought to be. The fact that the fowls on a gout-producing diet showed such troubles in the skin was an additional factor supporting members of the Society in the view held that balneology was one of the best means of treating chronic gout.

Dr. Douglas Kerr expressed the great pleasure it had given him to listen to the contribution of Dr. Chalmers Watson. He thought that by bringing forward the question of toxins as the cause of gout before the Society, many related useful discussions on the subject of gout would ensue. He did not propose to agree with or attempt to controvert

the theories put forward; but in the future discussions he hoped the suggestion which had been thrust upon him in practice, that gout now occurred in a different form to that in our grandfathers would receive attention. All must recognise the changed habits of life in which we lived to-day; the greater massing of intellectual mankind in cities, the greater strain of life, the nerve exhaustion, which all underwent; and he did not hesitate to say that the type of the disease had changed. It was very rarely indeed that, in his spa experience, he saw the old, typical, deformed knuckled gout. He could only recall three individuals in an experience of nearly twenty-five years at a spa, of under 40, with what were called chalk deposits. While he did not deny that the primary cause was probably in the alimentary canal, he thought the nervous element entered much more largely now into the clinical constitution of cases than formerly. Some years ago he changed his opinion from the view he had been taught, that uric acid meant gout, because in the urines of anæmic girls of 16 to 20 years of age one found a bigger proportion of uric acid than in almost the most gouty gentleman of one's acquaintance, and yet those girls had no gout. Uric acid and its salt formed a large and important element in an acute attack of gout, but, personally, he regarded it as more a result than a cause. Very likely the first attack had to be attributed to changed metabolism: and he had been much interested in what Dr. Luff said about the study of the action of colchicum in gout. Personally, he was not an advocate for the use of colchicum in gout, unless under necessity; he thought there were other drugs available which brought about as satisfactory a result. He gathered that Dr. Luff prescribed colchicum in purgative doses—(Dr. LUFF: Not necessarily)—because small doses of the drug apparently accumulated in the system and caused many of the depressant effects noticed by Dr. Luff in cases of colchicum poisoning. A big dose of colchicum, however, accompanied by a saline purgative, would produce results in gout as quick, and perhaps quicker, than would

its gradual administration. But the present was not the occasion for discussing the treatment of gout; and he chiefly wished to throw out the suggestion about the changed character of gout in recent years.

Dr. Solly said that the Society would always accord its thanks to anyone who would bring before its members definite ascertained facts, in preference to, or at least in support of, theories. The main difficulty in his mind was how to define "gout." The main results of Dr. Chalmers Watson's demonstration appeared to be that by feeding fowls upon a diet for which Nature never intended them he had produced an apparently general disease in which bacterial infection seemed to be a prominent feature. On the other hand, another observer in similar experiments had produced a disease apparently identical with gout, characterised by uratic deposits. He did not know whether the definition of gout ought to cover both these groups of symptoms or not. He had always held, and it was the current opinion where baths were administered for gouty diseases, that one was entitled to call certain groups of symptoms gout, even though they had no obvious deposits of uric acid, and this precludes a formulation of a strict definition. If it were agreed to give the name of gout to any disease due to disordered metabolism, the number of symptoms which could be embraced under that heading would be bewildering. At health resorts one saw very many cases vaguely called gout, but which were not the old-fashioned typical form of the disease. Possibly the nerve strain of modern life alluded to by Dr. Douglas Kerr came in and changed its character. Most spa physicians had seen cases in which nerve worries, insidious or acute, had apparently produced or aggravated the disease; but it was difficult to see how the growth of micro-organisms in the body could be appreciably influenced by nerve strain, supposing one took up the idea that gout was a microbial infection. He hoped that the bacteriological view would be worked at, but thought that facts as at present known pointed to gout being

a disorder of metabolism rather than the result of microbial infection. Dr. Chalmers Watson's work was of great value, even if only to check the drawing of rash conclusions from the work of other observers.

Dr. F. Parkes Weber asked what was the origin of the inflammatory changes shown by the author. He took it that the disease was one definitely due to microbes, and, pathologically speaking, of infective nature. It would have been very interesting if the author could have discovered what particular microbe was present which caused the inflammatory round-cell infiltration in the kidneys and in the other tissues. The question would then arise whether the disease caused by those microbes would in birds invariably lead to gouty deposits, or whether there was a peculiarity in the fowl in question, owing to which urate of soda was deposited in the inflammatory tissue. Did a peculiar diathesis in that fowl lead to the remarkable uratic deposits, which other fowls having the same disease due to the same microbe would not have presented? Also, were there any experiments showing whether in fowls in which patches of non-microbic necrosis had been produced by the injection of aseptic irritants there were deposits of urate of soda in the necrosed parts?*

Dr. Symes Thompson remarked, in reference to the last statement of Dr. Kerr, that he once collected a number of insurance statistics, by means of which he was able to show that modern gout, gout as we now know it, a degenerative condition involving the kidney, the brain, and other organs, was markedly injurious from an insurance point of view, *i.e.*, it was a shortener of life. On the other hand, the old-fashioned explosive form, as judged by insurance figures,

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* Dr. Weber was afterwards reminded by Dr. Garrod that Ebstein, by repeatedly injecting small doses of neutral chromates subcutaneously into birds and thus damaging their renal tissue, induced the formation of uratic deposits in their kidneys, serous membrane, &c. Many other toxic substances can produce uratic deposits in birds (experiments of J. von Kossa, of Buda-Pesth).

was not a marked shortener of life. Another point to which he would call attention was that a good deal of evidence had been accumulated of late, especially in the paper just read by my son before the Royal Medical and Chirurgical Society, as to the power exercised by both liver and lungs in removing toxins—what might be called the detoxicating power of liver and lungs. And he could not help thinking that the conditions—whether climatic or constitutional—which rendered one person susceptible to gout and another immune, had reference to the detoxicating power of the organs rather than to any specific condition of the intestinal mucous membrane leading to the development of toxins. It was to the detoxicating power of these organs that we had to look (which power might be powerfully modified by climate and baths) for the removal of the disease under discussion.

Dr. Chalmers Watson, in replying on the discussion, thanked the members of the Society for the very appreciative manner in which they had listened to his demonstration. With regard to the alteration in the character of the disease, Dr. Douglas Kerr's remarks were of great interest. He had himself been impressed by the same feature, and in the course of an investigation (statistical) on this point, he had been much interested to find that the total number of cases of gout admitted to St. Bartholomew's and St. Thomas's had diminished by about 50 per cent. in the last thirty years. While no conclusion could be drawn from this fact, the point was a suggestive one, and in harmony with Dr. Kerr's observation. Dr. Leonard Williams raised an important query—the influence of climate in determining the different results of Kiouka and the author in their experimental work. The influence of climate was doubtless an important one; but the speaker was inclined to attribute the difference in results mainly to the different breeds of fowls used for experiment. Kiouka used well-bred animals, and the author used common farmyard stock. It was well known that highly-bred animals were more susceptible to disease than animals of plainer breeding. In reply to Dr. Parkes Wilson. Dr. Chalmers Watson

stated that the tissues of the gouty fowl were unfortunately not obtained sufficiently fresh to allow of adequate bacteriological investigation. It was very desirable that such bacteriological investigation should be made.

Dr. Watson thanked Dr. Luff for drawing his attention to the paper published by Dr. Gore, in which views similar to those put forward by the speaker were clearly expressed; that paper had escaped his observation, but he would make a pointed reference to it in his paper when published. It was probably true that most new discoveries had been made before, and in any case it appeared to the speaker that Dr. Gore was to be congratulated on the number of disciples he had obtained. Dr. Luff had made the interesting statement that he had frequently seen tuberculous fowls in which the nodules were infiltrated with urates. This interested the speaker, and he would look forward to seeing such specimens.

Dr. LUFF: I think I can furnish you with some. I will see.

Dr. CHALMERS WATSON, continuing, said that one was taught by the writings of Duckworth and others that in the human subject there was something of the nature of an antagonism between tubercle and gout. They are extremely rarely associated. Speaking from an extensive experience of *post-mortem* examinations of poultry, the majority of which had succumbed to tuberculosis, Dr. Watson had never seen a single instance in which the tuberculous nodules showed to the unaided eye any trace of uratic deposit. In this respect his experience was thus in harmony with the opinion of Duckworth as to the non-association of these two diseases in the human subject. Dr. Luff must have misunderstood the speaker on one point. In the course of the demonstration it had been clearly stated that the photographs of the fowls shown did not represent gout. These photographs were shown to emphasise the importance of realising the diversity in the reactions of the tissues in different animals which were under uniform adverse conditions. The full consideration of the clinical and pathological

features of these fowls would be the subject of a later paper. The present paper had been concerned with *one* gouty fowl, not fowls. Dr. Luff had advanced no evidence whatever necessitating any modification of the conclusions aimed at in the paper.

A NOTE ON TANGIER.

ERNEST SOLLY, M.B., F.R.C.S. (HARROGATE).

ALTHOUGH not strictly speaking a British health resort, Tangier at present belongs to no other country which is climatically in rivalry with Great Britain, though the time when it will come under French influence is possibly not very far off. However, as it is neutral ground at present, I thought a very brief note upon its features from the health resort point of view might be of interest to the Society, and the fact that we were to have a lantern at this meeting made me ask our Secretary if he thought it would be agreeable to bring this short note before you to-night. Tangier is only a climatic station, there being no mineral waters and only a very limited amount of sea-bathing, and the facilities for landing and for getting about the town and country round are too primitive to make the place suitable for anyone seriously invalided. It is especially suitable for those who only want a mild climate accompanied by the beneficial effects of scenery and life absolutely different from those of civilised Europe. It must be remembered that landing from the steamers has to be carried out by means of open boats with the usual accompaniments of a shouting mob of partially clothed Arabs, and when the wind is easterly the water may be disagreeably rough. The boats take visitors to a little wooden jetty, and one can only regret that England, when in the reign of Charles the Second she abandoned the town after only about twenty years' ownership, took the trouble to demolish the fine stone breakwater which had been built at great cost under the Governorship of the Earl of Sandwich. Once landed, there is a fair selection of hotels, from the "Continental" down in the town, quite near the landing-stage; the "Cecil" practically on the beach; the "Bristol" in the business quarter of the town, and another mainly commercial, to the "Villa de France" and the "Villa

Valentina," high up and out of the town, among the houses and gardens of the Legations, and the residents who are mostly connected with them. All these are reasonably comfortable, and, for those contemplating a long stay, houses can be taken without any great difficulty, though rents run relatively high.

To get the proper amount of enjoyment out of Tangier, however, I think it is essential to be able to ride; but this is not a very serious difficulty to anyone with the slightest power of balance, as donkeys and mules with comfortable pack-saddles can be easily and cheaply obtained. Roads for wheel traffic do not exist, so there is no driving, nor even scope for a bath chair. A mild, equable climate, not too warm to make exercise enjoyable, except of course in the summer months (when visitors do not go there), makes Tangier to my mind an ideal place for convalescence from almost all complaints, but especially pulmonary troubles, and for asthma, for which, I believe, it is already recognised as excellent by many authorities. The mean winter temperature is about 55° F., the mean summer temperature about 70°, and it is never excessively hot, even in the height of summer.

The country is also a delightful one for camping out in, and facilities for this are easily obtained. The rainfall is about 33 inches, but even in the rainy season (usually November to February) the chief fall is usually at night. The political disturbances in the country have given rise to a good deal of unnecessary alarm, but all who have been there know how very much exaggerated most of the reports were, and how little those on the spot cared for or were in any way affected by them. The country as a whole is no doubt more or less unsettled, but hardly more so than it has been for a great many years, and I don't think that anybody going there runs the slightest risk of personal danger, unless they go and deliberately mix themselves up with local disputes, or go, as some Europeans actually did, to look on as spectators where inter-tribal fighting was going on.

A few details may be added with regard to the sanitary

conditions of the place. Drainage in the Moorish quarter, of course, hardly exists at all, but the hotels inhabited by Europeans are as well supplied as in many of the continental health resorts. Of the water supply to the European parts of the town, the hotels and residential quarter generally, the same may be said. A great deal of it is derived from a spring brought in from outside the town, by an aqueduct built probably by the Romans, which still is in as good condition, practically, as when it was built.

There is at present no English doctor resident all the year round. When I was there in 1902, the late Dr. Jefferson, formerly of Leamington, was there; but he died in March of this year, and I have not since heard that anybody has settled down permanently in the place. Of the residents, Dr. Roberts, the medical missionary attached to the Medical Mission Hospital, is available, but does not profess to undertake private practice, and the other Englishman, Dr. Hodges, though still living there, retired from active practice many years ago. There is a lady doctor attached to the Mission Hospital for Women. Of the rest, Dr. Fumey, a French gentleman, has probably the largest practice, and as he attends the British Legation, he has secured most of the practice amongst the English residents. Most of the rest of the practice is divided between two doctors who are respectively Russian and Spanish. A very good English pharmacy was started there last year and supplied a great want. The first year I went out I had occasion to prescribe an effervescing mixture for a patient who was suffering from fever, and the mixture was sent out without the citric acid, and as I had not stated to the patient's friends that the mixture ought to effervesce, the mistake was not discovered till my next visit. The consequences were not serious as it happened, but the incident was not calculated to give confidence. Since then, however, things have been altered for the better, and a well-stocked English pharmacy offers all that one could wish.

To sum all up, it may be stated that Tangier, though

unsuited for those crippled in body or seriously invalided, is a charming place for convalescence from temporary illnesses such as the exanthemata, influenza and the like; it is also good for some asthmatics, and perhaps best of all for neurasthenics, and that large class of people who, though not exactly ill, are nevertheless in need of a complete change, mental and visual, as well as physical.

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BRITISH BALNEOLOGICAL AND CLIMATOLOGICAL SOCIETY.

WEDNESDAY, JANUARY 20, 1904.

PHYSICAL THERAPEUSIS—A RAPID REVIEW.

BY W. S. HEDLEY, M.D., M.R.C.S.

TO-NIGHT I have undertaken the rather difficult task of laying before you a short survey of certain important areas in the field of Physical Therapeutics. I know that this Society regards the various forms of energy with which I have to deal as useful adjuncts to spa treatment and it is a suggestive fact that the balneologist of to-day finds himself alive to the possibility that he has all along been unconsciously using at least one such agency in the radio-activity of his own mineral springs. In this connection there are certain recent events which this evening may well claim our attention first.

It is a matter of common knowledge that Professor Dewar has, in examining the gases collected over the King's Bath at Bath, discovered the presence of helium in the water. It is also well known that Sir William Ramsay and Mr. Soddy at University College, have seen the spectrum of helium develop in a vacuum tube into which nothing but the radiations and "emanation" of radium had been allowed to pass. In other words, radium evolves helium by a spontaneous change. Therefore the presence of helium suggests radium; and so a quantity of deposit from the Royal spring was forthwith despatched to Mr. Strutt, who was soon able to report that the deposit contained an appreciable quantity of radium,—not sufficient to pay for extraction. Still in view of the therapeutic possibilities of radium, this discovery must be looked upon as a new asset to Bath and doubtless other watering places. It is possible and perhaps more than possible, that a substance

undergoing such constant change and disintegration as does an atom of radium, may fling off from itself something which either actually, or in some process of spontaneous change, may be of active therapeutic value. Such substance being in a "nascent" form might help to explain the comparative inefficacy of the waters of certain springs when removed from their source; and the same fact would perhaps supply a reason for the recognised difficulty of successfully imitating mineral springs.

I do not propose to enter into a minute analysis of the radiation and so-called "emanation" of radium. Everyone knows, and is tired of being told, that the radiations from radium are of three kinds: (1) Gamma rays, probably some variety of X-rays, but even more penetrating than the latter, and said to be able to pass through a foot of iron; (2) beta rays,—flying particles known as "electrons," or "cathode rays," or "Crooke's rays;" (3) atoms of matter, each 1 per cent. of the weight of the radium atom, thrown off at a velocity of 100,000 miles a second, known as the Alpha rays. These are the rays that make a splash or scintillation on the zinc screen in the spinthariscope, and to the bombardment of which the heat evolved by radium is said to be due. (Spinthariscope shown.) Over and above these discharges there is still a something remaining known as "the emanation" of radium—something that can be blown away, yet that is intensely radio-active, unstable, and gradually changing into other substances until at last it becomes something which is not radio-active at all. Now that these radiations have been separated and analysed it remains with us medical men to employ them separately, and experimentally ascertain their individual usefulness for therapeutic purposes.

When, in 1896, Becquerel discovered radio-activity in uranium, he recognised in it all the properties of radium, only "less so." It was this discovery which showed that the old idea of the "ultimate atom" and its stability must be given up. The atom, small as it is (we are told

that 300 millions of them can lie side by side in an inch), is not the smallest particle of matter that can exist. The electrons that compose the atom are 1,000 million million times smaller—their relationship to the atom in point of size being, according to Lodge, as a grain of dust-shot to the Birmingham Town Hall. The atom is to be conceived of as a sphere of influence filled with flying forces,—the electrons, which are ever being flung off into space. The atom is in point of fact compound and unstable; its disintegration and the manner thereof is the explanation of radio-activity.

Analogous to, but not identical with, X-rays and of even greater penetrating power, are the γ-rays. Mr. Strutt says that they agree in their power of not conveying an electric charge, in their photographic and screen effects, and in ionising power, but that they differ in their ionising effect on different gases, and it is on this last point of difference (shown markedly, *e.g.*, in carbon tetrachloride and methyl iodide) that he bases his doubts.

The power of discharging electrified bodies is an easy test for radio-activity. Rub a stick of sealing wax on flannel, and it is capable of attracting pieces of thin paper, but let the rubbed sealing wax be passed over radium, and this power is lost.

The emanations from radium seem to have a bactericidal effect. Aschinas and Caspari (*Prog. Med.*, 1903) state that a three hours' exposure to a radium preparation (strength not given) killed *Micrococcus prodigiosus*. Pfeiffer and Friedberger (*Berl. Klin. Woch.*, July 13, 1903) state that in the case of cultures of typhosus and cholera bacteria exposed at 6 c.m. from a radium preparation (R.A. not given) the result was negative; but at 1 c.m. distance there was in plates markedly turbid from bacillary growth, a central bright portion, about 2 c.m. in diameter opposite the radium. At a Conversazione of the Royal Society, May 15, Mr. Henry Crookes showed plate cultures of several kinds of bacteria which had been exposed to radium

emanation through a mica screen. The results proved the "bactericidal effects of electrons from radium." In every case it was found that the organisms were killed in those places where they had been exposed to the action of over 10 milligrammes of radium bromide. On incubation a bare space free from bacterial growth was left on the plate opposite the point where the radium had been placed. The organisms so exposed were *Bac. liquefaciens*, *Bac. coli commun.* and *Bac. prodigiosus.*

Not much is known of the physiological effects of radium radiations. They produce luminous effects upon the closed eye, and this is presumably due to fluorescence of the membranes, or possibly to an action on nerve centres. According to Konigstein (*Sem. Med.*, June 17) the former explanation is correct. Sachs considers that the luminous effects provoked by radium at the sides or back of the head are perhaps due to the fact that the retina can be excited by rays acting on its posterior surface (*Sem. Med.*, June 17). Notwithstanding some rather sensational views of the possibilities of radium in the treatment of the blind, it is at least difficult to imagine how non-refrangible radium rays can form images on the retina. It seems also to have been proved clinically in cases of atrophy that these rays do not affect the sensibility of the retina (Holzknecht, *Sem. Med.*, June 17, 1903). Burns like X-ray burns are produced upon the skin, the muscles being more resistant; but Hallopeau (*Rev. d'El. et Rad.*, Dec., 1902) reports that atonic ulceration lasting five or six months has been produced by too prolonged exposure to radium. Experiments upon the vertebral column of animals show that exposure to these rays may cause paralysis, convulsions, or ataxia, and may even be followed by death.

Approaching the question of the therapeutic effects of radium it is evident that these must vary with the R.A. of the salt used, the length and method of its application, the condition of the part, and the distance from the surface treated. Further, there are two obvious methods of

using it according to the nature and requirements of the case: (1) Short and repeated exposures; (2) prolonged applications producing ulceration. Using an R.A. of 1,900 to 2,500 (Curie) there is, after thirty-six hours' application, at first no change, or at most a little redness on the skin; but after a period varying from five to fifteen days the part assumes a white and macerated appearance, often a blister follows succeeded by ulceration almost as intractable as that after Röntgen rays. The salt being usually put up in a glass tube, the application is often made by simply holding the tube to the skin; and it is obvious that it is thus easy to apply it to small or inaccessible cavities. The only really comparative test case treated under my own observation was one in which three patches of lupus were treated on the face respectively by Finsen light, X-rays, and radium. To-day the patch on the nose (the radium patch) is well. The others on the cheeks nearly so, and evenly so. In this case the radium tube was simply held against the patch for five minutes by the patient herself, the R.A. being 7,000, a good standard strength for ordinary use. For external use a bell-shaped cup is sometimes useful, within which the small radium tube is properly secured by wire, an arrangement which also makes it adjustable (Morton). Of course ingenuity will suggest, with so manageable a material, an infinity of methods of application. For the eye ointments would be available, or sub-conjunctival injection (Darier), or a similar solution for administration by the stomach (ulcer, cancer), also suppository, inhalation, &c. For external application a sort of plaster consisting of the salt of various activities sandwiched between mica plates. Its costliness is of course against the employment of radium, but the optimist may see a means of getting over this in the fact that radium has the power of transferring a portion of its activity to certain metals brought into its proximity.*

* Specimens were shown of thorium and pitchblende plasters for prolonged application, as well as samples of radium of various strength

As to the theory of its action, Exner and Holzknecht consider that "radium rays irritate the cells of the strata of the skin less vehemently than they irritate the cells of cancer and sarcoma. The latter are brought to necrosis before the other tissues suffer severely from the effects."

Speaking broadly (and loosely) radium has frequently been used in lupus (with cure), in psoriasis occasionally, in epithelioma of the orbit, in orbital neuralgia and acute iritis, with relief of pain, in rodent ulcer and superficial malignant disease with apparent disappearance of the growth, in cancer of the breast with relief of pain.

Scattered through the pages of current literature there are a fair number of "cases" to be found, but the number of these that combine the essentials, of accurate details of treatment and definite result is phenomenally small. The following are within the knowledge of the present writer, but it cannot be said that they all fulfil the test conditions required :—

(1) A case of lupus of the face treated by M. Danlos with an R.A. of 19,000. The total exposure was thirty-six hours ; a smooth white cicatrix followed (*Rev. d'Elect. et Rad.*, Dec., 1902). Treatment was commenced with a mixture of chloride of barium and chloride of radium in rubber or celluloid bags 4 or 5 centimetres square, but the active surface was only 15 by 25 millimetres. This arrangement was given up, partly on account of the difficulty of maintaining asepsis in the rubber, and partly because the radiations were propagated to the detriment of neighbouring organs, *e.g.*, the eye. The radio-active substance was then enclosed in wood, covered by lead, with an aperture on one aspect so as to limit the action of the radium.

(2) Several cases of lupus are described by Dr. Blandamour in which the exposure was twenty-four to forty

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and in various kinds of "applications" for throat, nose, vagina, &c., kindly prepared and supplied for the occasion by Mr. Martindale of New Cavendish Street, W.

hours with an R.A. of 5,000 to 19,000. (*Sem. Med.*, Jan., 1903.)

(3) Lupus of hand, treated by Dr. MacIntyre with "radium rays" for twenty minutes every day for three weeks—disappearance of disease. (*Adv. Ther.*, Dec., 1903.)

(4) Lupus of nose. (Dr. MacIntyre.) Treated for four weeks. Result as in last case.

(5) Psoriasis, back of hand, duration twelve years, area two inches in diameter. A tube containing 1 gramme radium and barium, R.A. 1;500. Tube held in a stand one inch from diseased area. Improvement at end of two weeks. (*Adv. Ther.*, Dec.)

(6) Melanosarcoma of the left humerus:—Had been operated on three years previously; for the past eight months had noticed several small subcutaneous dark coloured nodules near the seat of original disease. First seen February, 1903, at the late Prof. Gassenbauer's clinic; microscopical examination proved it to be melanosarcoma. A small capsule of vulcanised indiarubber, one side of which was replaced by mica, fixed to skin by means of bands of plaster, exposure from five to twenty-five minutes. No metastatic nodule exposed more than once. Between two and forty-eight hours after exposure to the radium dermatitis ensued. At the end of fourteen days this had disappeared. In spots, when the exposure had lasted less than a quarter of an hour, there was no change whatever. the dermatitis having disappeared; but in those where the exposure had lasted fifteen to twenty-five minutes a number of metastatic nodules had diminished or disappeared. Other nodules also appeared on the shoulder, breast and left humerus. In a month all nodules had disappeared—their place being only revealed by a depressed cicatrix (cases shown by Exner and Holzknecht Med. Soc., Vienna, June 26, 1903).

(7) Melanosarcoma, another case with metastasis of the skin; same result (also shown by the above-named on the same occasion).

(8) Carcinoma mucosæ oris. Operated on about sixteen years ago, and again about eleven years ago, and again five years ago. When seen on May 11, 1903, condition as follows: On upper and lower lips and corner of mouth right side, there was an ulcer the size of a shilling, and a hard tumour the size of a small nut was found to be extending into the surrounding tissues. Microscopical examination proved carcinoma of epithelial type. Another similar tumour on left of palate. First tumour exposed to radium on August 11, and on six occasions afterwards, each spot being treated from fifteen to twenty-five minutes. Seventeen days after first exposure ulcer healthy and nodule disappeared within the next twelve days, no trace being found when shown on June 26. It appears, however, that malignant cells had remained in the deeper tissues; the patient was again attacked by cancer and after a few months, died. (Exner and Holzknecht, Med. Soc., Vienna, June 26, 1903.)

(9) Epithelioma, left cheek, size of sixpenny piece, margin hard and raised, centre depressed. Capsules containing radium applied. After three days the margin had become level with the centre. Two further applications of five minutes each were necessary for disappearance of disease. Patient did not again present himself for treatment, therefore subsequent history unknown. (Holzknecht, Med. Soc., Vienna, June 26, 1903.) Several cases of rodent ulcer have been healed, and it is quite evident that this condition yields to radium as well as to X-rays and other methods of treatment.

(10) Sarcoma, involving buccinator region and mucous membrane of lower left maxillary region. Treated with chloride of radium and barium. R.A. 7,000. Pain almost completely controlled, induration softer, improvement in mobility and appearance of ulcer. Afterwards relapse in the latter, and the radium being no longer available, reverted to X-ray. (Dr. M. Cleaves, Am. Elect. Assoc., Sept., 1903.)

(11) Malignant ulceration involving cervix uteri. Symptomatic improvement. (Ref. as in last case.)

(12) Epithelioma recurrent. Rodent ulcer type; treatment just commenced. (Ref. as case 10.)

(13) Malignant disease of breast, recurrent, with return of stabbing pain in breast and axilla. Pain controlled from the first. (Ref. as case 10.)

(14) Epithelioma of neck, one and a half by two and a half inches, and elevated a quarter to half an inch above surrounding parts, edge indurated, surface covered with crusts. A tube of radium (10 milligrammes), R.A. 300,000 fixed in tube holder about one inch distant from the part; exposures from fifteen to twenty minutes three times a week. After a week's treatment growth softer, with tendency to slough. "Cure expected." (Dr. Tracy, *Adv. Ther.*, December, 1903.)

Without doubting the therapeutic future of radium, and without imagining that the few cases here referred to represent anything like the whole of the work that has been done, it must nevertheless be apparent that we have not advanced far on the road to success in radium therapeutics. At the same time there can be no reasonable doubt that such superficial diseases as lupus and certain cutaneous affections, as well as rodent ulcer, can be successfully treated by radium. Further, that there is some probability that in the future other forms of malignant disease may yield to more powerful preparations and better methods; but actual demonstration of the latter is still lacking. The end of 1904 may have a different tale to tell.

It is to be hoped that there will soon be forthcoming a series of clinical cases carefully diagnosed and exclusively treated by radium salts of given R.A., under definite experimental conditions. In the meantime it is necessary to keep an open mind.

We cannot pass from the subject of radio-activity without referring to the "n" or Blondlot rays. M.

Blondlot, of the University of Nancy ("n" rays from N-ancy) experimenting in 1903 with radiations from a focus tube, discovered that X-ray tubes emitted a new kind of light of high refrangibility and of conspicuous penetrative power. Although their wave length was still to be determined, these new rays are unquestionably of the nature of light rays and they seem to find their place in the gap between the infra-red and the shortest wave lengths of the Hertzian waves. This relationship is of importance as it helps to bridge over the gap between electrical action and radiant energy. The screen suitable for their visual demonstration is one of calcium sulphide. They resemble the ordinary rays of light in being capable of being reflected, refracted, and polarised, and brought to a focus by means of a quartz lens. They seem to be true light waves (ethereal undulations) and not electrons, effluvia, or other radiatory emanations.

Professor Charpentier, at the French Acad. of Med., claims to have shown that the nerve tissues of the human body emit "n" rays, their amount largely depending upon the quantity of nervous tissue present, and the more active or injured it is the larger the number of N-rays emitted. These rays, or rather this group of rays, all act upon phosphorescent bodies. In this connection I need not remind any one here that phosphorescence has nothing to do with phosphorus. Fluor spar, as we know, becomes luminous when light falls upon it. Hence any substance that does the same is called "fluorescent"—clorophyle, paraffin oil, solutions of quinine, platinocyanide. The difference between this and phosphorescence is that in the former it ceases when the incident light is cut off; but other substances, such as sulphides of calcium, barium and strontium, continue to emit the light *after* the incident light is cut off. Thus phosphorescence is rather a misleading term, for the glow exhibited by phosphorus is due to slow chemical action, while the glow of a phosphorescent body is not due to chemical action—it is really fluorescence which persists after the source of light is cut off.

In an interesting and suggestive article (*Journ. of Surgery*), Dr. Morton, of New York, describes a method of inducing artificial fluorescence in the tissues. He gives perhaps 5 to 20 grains of quinine before each raying. He is satisfied that in cases of Hodgkin's disease it has been of service. The question is how far the quinine would have been useful without the raying. It is reported since then that cases of cancer have disappeared under this treatment, but I have not seen Dr. Morton's own Report.*

Now what is being done by this procedure? We know that if a solution of sulphate of quinine be held in different parts of the spectrum it is only in the blue and violet that it becomes fluorescent (as with white light), and this fluorescence also occurs with the ultra-violet rays. Now what is the nature of the light emitted from this fluorescent body? It is not only one part of the spectrum, *i.e.*, it is not monochromatic—it contains various colours, but of course always of a greater wave-length than the wave-length of the light which causes the fluorescence. The quinine absorbs the X or other ray, and transforms it into a lower wave-length consisting of a number of portions of the visible spectrum. In other words, the disease is being treated by light. It is actinic treatment in the interior of the tissues.

Heat and its Therapeutics.—Some years ago I showed before the Balneological Society an apparatus devised for applying to the body direct heat rays from a luminous source. It consists of incandescent lamps (each carrying two ampères of current) fixed in reflectors. This method has stood the test of time, but clinical experience has taught us some further lessons in connection with its employment. I ventured to say then that when the heat is from a luminous source a comparatively low temperature

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* I have since seen Dr. Morton's report of seven cases of Hodgkin's disease thus treated with five "recoveries" and two deaths, also three cases of carcinoma of breast and one case of rodent ulcer recovered.

only is required to produce diaphoresis. This is fully confirmed, therefore instead of using the recumbent bath with broad filament lamps carrying powerful currents we now employ simply a cabinet filled with a number of ordinary incandescent lights. If on the other hand there is required not only a sudorific but a powerful "counter-irritant" or "sinapism effect," the higher temperature and the heavier currents are necessary. It is not difficult to conceive how cutaneous nerves thus stimulated over a wide extent of surface send co-extensive ingoing impressions to nervous centres—impressions that are reflected thence to various internal organs (with which special cutaneous areas are known to be in direct neural communication). Another practical lesson that I think I have learnt is that in addition to the dilatation of the cutaneous vessels, the diaphoresis, the revulsive effect, the absorption of exudation by long sittings, there seems to be a direct stimulation to nutrition by short sittings. In other words, a radiant heat and light bath of short duration acts as a tonic. The third and not the least important lesson to be learnt is that although the incandescent light bath is on the whole better tolerated than any other diaphoretic procedure, there is an acceleration of the pulse-rate and a diminution of blood pressure which must be reckoned with, especially in persons with a feeble heart.

I have seen it stated even in medical publications that unless a patient is treated at 300° to 450° F., he is "not getting his due." If this means that the human skin can tolerate such a temperature, we of course know the statement to be incorrect.

The question of heat from a luminous source brings us to the borderland of photo-therapeutics. Now although diaphoresis is most easily produced when the heat is from a luminous source, still I think this is the direct result of the calorific rays, because if an arc lamp is used (where the chemical rays are in greater relative number) the sudorific effect is less.

Light.—Bactericidal effects have been claimed for the arc lamp, and this is doubtless true in the case of powerful arcs; but Krebs (*Zeitschrift für Diet. und Physikalischen Ther.*) seems to have proved that the arc lamp using five ampères of current such as is used in the ordinary electric light bath have practically no effect on the micro-organisms of the skin; and even in the case of lamps taking 60 to 75 ampères, Freund has found that no bactericidal action occurred when such rays passed through living tissue. The ear of a black rabbit was stretched between the rays and a plate culture of staphylococcus pyogenes aureus. The culture was placed in the incubator after an hour's exposure, but next day was found to be covered with colonies of bacteria. The same experiment was performed with the ear of a white rabbit, and also with the ear moistened with adrenalin, with the same negative result. In all three cases inflammation of the exposed ear developed in twenty-four hours.

But all this is far from saying that the full radiant energy of the arc is without effect on the interior of the body. It is the opinion of some observers that light represents a fact of enormous importance in the treatment of consumption, especially through the chemical end of the spectrum. Dr. Cleaves, of New York, who has made extensive use of all the full range of radiation of the arc has always suggested that influences other than the chemical rays are active. It may be that, to get an effect upon the deeper tissues, rays of large wave-lengths are necessary, just as in the case of sound the deeper tones with large wave-lengths are conducted over longer distances and through greater obstacles, than the higher tones. It would thus appear that between the effect of luminous heat pure and simple,—the domain of the incandescent light bath, and the chemical rays—the land of Finsen, there is a range of radiation which is well worth investigation, and which has some claims to therapeutic effects; but those claims cannot yet be considered fully proven.

Coloured Light.—Dividing up the spectrum and using its various components, Freund is of opinion that acne vulgaris, ulcers of the legs, &c., are favourably influenced by long exposure to intense red light. The views of Finsen with reference to its employment in small-pox are well known, as the ultra-violet rays are thus excluded, which he considers are the cause of "pitting"; and the opinion is supported by much experimental evidence and 150 cases. Schamberg (*Journ. of Am. Med. Assoc.*, May, 1903) considers that there are numerous facts which militate against this view, but he brings only two cases and some theoretical considerations to his support. It was reported by a member at a recent meeting of the Dermatological Society of Chicago, that he had used red light in the treatment of measles and erysipelas without good result. On the other hand, Krukenberg (*Munich Med. Wochen.*) reported eighteen cases of erysipelas, and thought that the fall in temperature and general amelioration of the symptoms was undoubtedly due to the exclusion of the chemical rays. He thinks that the favourable action of ichthyol, of tincture of iodine and various plasters, is explained by the protection given to the skin against the chemical rays. The negro is protected from these rays by the colour of his skin and according to certain authors, is not much subject to erysipelatous and phlegmonous inflammations.

Minime considers that blue light has an action on vaso-motor nerves, that it is endowed with analgesic qualities, and that it ameliorates or cures superficial neuralgias. The anæsthesia it produces he considers sufficient to perform certain small operations without pain. It also favours the cicatrisation of wounds. Kaiser, observing the favourable action of light on a septic ulcer, carried out further experiments and found that (1) tubercle bacilli in pure cultures were killed in thirty minutes by a powerful blue light arc at a distance of 5 metres, whilst they survived the radiation of an ordinary arc; (2) tubercle bacilli

placed on a patient's back, blue light being at the same time directed to the chest at 5 metres for thirty minutes and the procedure repeated in six days, became weakened; (3) pure cultures of tubercle bacilli were killed when exposed to the radiation of an arc concentrated through a hollow lens containing a solution of alum and methylen blue with ammonia; (4) when the spectrum was split up cultures lived in red and yellow, but were killed from the blue violet to the ultra violet; (5) photographic plates attached to patient's back (light being excluded) and the radiation sent through the patient's body, a blurred positive was obtained. Subsequently to these experiments Kaiser treated two cases of advanced phthisis with the same blue light; after six days night sweats ceased and cough became less; at the end of six weeks there was continued diminution in the number of bacilli. In tuberculous abscesses of the thigh healing was obtained in four weeks. In a tuberculous child with weeping eczema cure was established in five weeks. Therefore in view of the foregoing experiments Kaiser thinks that blue light kills tubercle bacilli; that chemical rays can pierce the body sufficiently strongly; that blue light acts powerfully as a resolving agent and also as a local sedative; that with a sufficient current-concentration it may even produce anæsthesia.

Finsen Treatment.—Coming to Finsen and his rays we find ourselves on firm ground again. Of 800 cases treated at the Finsen Institute there was improvement in 90 per cent., cure in 70 per cent., reappearance in 20 per cent., the latter being generally cases where the mucous membranes were affected. Finsen seems to think that the number of cases of tubercular lupus really incurable need not be estimated as more than 2 per cent. It is very different with L. erythematosus and epitheliomata. There are good results in alopecia areata and a small percentage of cures in acne and chronic eczema.

The last point in the therapeutic use of light is dosage. It is evident that for its systematic application a measuring

instrument becomes necessary; such an instrument seems to be found in the actinometer. Its principle is to let the rays play upon a screen of platino-cyanide of barium and then see what thickness of solution of ammoniated sulphate of copper will cut off the chemical rays.

Röntgen Rays.—The radiographic art is year by year improving in technique and growing in usefulness. Its ambition runs along two chief lines, viz., to get pictures of soft structures and to get pictures of deep structures. Leaving aside the former as not being yet, as a rule, quite within the range of practical work we have all experienced the difficulty even with our best tubes of obtaining clear and well-defined images of the deeper portions of the body—the pelvis, renal and biliary calculi, &c., even after using abdominal compresses and other devices. This indistinctness is of course caused by secondary rays, *i.e.*, rays that are produced by the diffusion and reflection of X-rays in the interior of the tissues, as well as those more evident secondary rays which come from the wall of the tube. The obvious means of suppressing these secondary rays is a diaphragm, but then we must of course be content with a smaller picture. To secure a clear picture over the whole plate, Mr. Pasche, of Berne, instead of using an immovable pencil of rays circumscribed by a diaphragm (an arrangement which would of course affect only a small area of the plate) uses a movable pencil of rays and two moving diaphragms.

In the radiography of calculi it is to be remembered, as is well known, and as has recently been pointed out by Guilleminot, that the degree of permeability of transparency of any substance is in inverse ratio to the power of that substance to absorb the rays. This power of absorption is chiefly a question of atomic weight. The importance of volume and density are both much less important than the chemical composition of a substance. It is the chemical composition of a calculus or rather the

atomic weights of its elements that is the important point. The soft parts, nerves, vessels, muscles, &c., are transparent to X-rays, *not* on account of their lesser density, but because they are formed of organic combinations containing almost exclusively, hydrogen, carbon, nitrogen and oxygen—elements of low atomic weight. The bony parts are the reverse of transparent, that is to say, they absorb the rays less, not so much because of their density, as because of the high atomic weight of their two most important constituents, lime and phosphorus. Consider the principal elements of which the calculi are composed, and their atomic weights may be tabulated as follows :—

Hydrogen ..	1	Magnesium ..	24
Carbon	12	Phosphorus ..	31
Nitrogen ..	14	Sulphur.. ..	32
Oxygen	16	Potassium ..	39
Sodium	23	Calcium ..	40

Guilleminot further points out that according to this, carbonic acid, uric acid and oxalic acid have, like water and ammonia, very little power of absorbing X-rays, because they have low atomic weights—hydrogen, carbon, nitrogen, oxygen. As to the salts formed by these acids, carbonates, urates and oxalates, their power of absorption increases with the atomic weight of the metal which enters into combination. Thus we can arrange the urates according to their increasing power of absorption—urate of ammonia, urate of soda, urate of magnesia, urate of potass, urate of lime. On account of the high atomic weight of calcium the lime salts have a power of absorption greater than corresponding salts of other bases. In the same way on account of the high atomic weight of phosphorus the various phosphates have a notable absorptive power, and the phosphate of lime, owing to the combination of two elements of high atomic weight possess the greatest absorptive power.

Thus at the bottom of the scale comes uric acid, at the top of the scale comes phosphate of lime. But

density does make a difference; other things being equal and in spite of its lower atomic weight an oxalate of lime calculus possesses a greater absorptive power than a calculus of phosphate of lime, because it is much more dense. The greater or less purity of the stone must be considered. Names are generally given owing to the preponderate ingredient but uric calculi are often mixed with lime. Indeed it is safe to say that unless they are so mixed they cannot be distinguished from the soft parts.

The whole question practically amounts to this, that unless phosphorus and calcium enter into the composition of a calculus it is impossible to get a radiograph of it. Further, the size being equal, oxalate of lime calculi are the easiest to distinguish, then phosphate of lime. Under a certain size, less than a pea, any calculus, whatever its nature, may fail to appear in a radiograph, especially in stout people.

Equalling, if not transcending, in interest the technique of radiography, are the therapeutic applications of the X-rays. All admit the success that has attended X-ray treatment in a large number of cutaneous affections and superficial malignant disease, lupus, eczema, psoriasis, acne, epitheliomata, rodent ulcer. It is further generally conceded that raying will often relieve the pain of deep-seated cancer, neuralgic and other pains, that it may relieve cough in lung disease, and that it may favourably influence the healing and pain of some forms of ulceration.

Cutaneous Carcinoma.—Pusey gives twenty-seven cases (they include rodent ulcer), twenty-one of which, or 78 per cent., are to all appearance cured, seven of the number having been well for over eight months, and the cosmetic excellence of the results no one can question.

Lupus Vulgaris.—X-rays are now an established form of treatment, possibly in some measure to supersede the arc lamp, and results equal or approximating Finsen's statistics have been claimed.

Eczema, especially of the chronic indurated type, acne,

psoriasis, and lichen planus have been successfully treated. As for lupus erythematosus, several successful cases are reported, but all that can be said is that it is as good, or possibly a little better, than other similar agents.

Primary Carcinoma of the Breast.—The following seven cases might represent average results: One symptomatic cure; two died with diminution in the growth; three were checked for the time being; and in one there was no result.

Carcinoma of the Head and Neck.—Ten cases—eight fatal—two symptomatically cured.

Carcinoma of Abdomen.—Nine cases—no effect but relief of pain.

Carcinoma of Pelvis.—No satisfactory results.

Carcinoma of Anus and Rectum.—Some relief of pain and shrinkage.

Varney (*Elect. and Radiol.*, October) gives fifty cases of cancer, of which 38 were grave inoperable cases, 13 were sarcoma, 37 carcinoma, 18 of the latter epithelioma. Of these 50,—10 ended fatally, 5 were unimproved, 8 improved, 4 sent for operation. Nineteen discharged "clinically cured."

Morton gives 16 cases of various kinds treated by X-rays—all cured but one. Carcinoma, 2; epithelioma, 5 cured, 1 failed; carbuncle, lupus, psoriasis, cheloid, acne, alopecia areata, sycosis, cured; fibroid of uterus, symptomatic cure, reduced in size.

Sarcoma.—Eleven cases are given by Pusey—three symptomatic cures.

Coley thinks that in cases of sarcoma the combination of toxin with X-rays often proves successful when neither agent seems to control it separately. He gives 10 cases of different varieties of sarcoma treated by X-ray and toxin injection: (1) Large tumour in right cervical region, clavicle to mastoid, microscopic examination proved round-celled sarcoma and a mass only about the size of an olive. Patient left hospital entirely well; (2) sarcoma femur,

metastases to lung; (3) small round-celled sarcoma, pectoral region—complete disappearance of tumour; (4) round-celled sarcoma—fascia of thigh, treatment failed; (5) recurrent sarcoma of parotid—patient died; (6) recurrent melanotic sarcoma of the iliac glands—still under treatment; (7) spindle-celled sarcoma of upper jaw—no result; (8) round-celled sarcoma gracilis muscle, disappearance of tumour; (9) small round-celled sarcoma neck, entirely disappeared; (10) sarcoma of parotid, inoperable, results of treatment promise well. Reviewing the whole position with reference to X-rays in malignant disease, it would appear that in small epitheliomata, for instance, a small well-defined rodent ulcer, the knife is the better procedure unless of course the age of the patient or other things contra-indicate it, but in very extensive cutaneous cancer, inoperable on account of size, the X-ray has proved itself useful. Those who have used this method have perhaps in their enthusiasm unintentionally magnified their results, and when an author gives 90 per cent. of cures in cutaneous epithelioma we must certainly discount his figures.

Further it must be well understood that in undertaking the treatment of deep-seated cancer there is reasonable hope of the relief of pain, but that beyond this it is nothing more than a safe and commendable experiment. It is not quite clear by what *mechanism* pain is relieved. The superficial vaso-motor dilatation at first produced has been credited with this, but it seems easier to fall back upon some direct action on nerve terminals or even nerve centres, and *apropos* of this it has never yet been disproved that a neuritis is the starting point of X-ray injuries.

Cancer of the Uterus.—It is still doubtful whether any permanent benefit has resulted beyond the relief of pain, but it certainly ought to be tried. In cancer of the breast the results are on the whole satisfactory, although by no means constant. After operation it is good practice to ray the entire area and its vicinity to prevent

recurrence. With reference to raying before operation I hesitate to advise it in the fear that it may exercise some undesirable action on the healing of the wound.

Looking at Coley and Pusey's results there are often good results in sarcoma, especially with the combined treatment. It would appear that it is chiefly on the morbid elements that the treatment exercises any influence. A destructive process beginning at the periphery of the cancerous mass extends deeper and deeper and this degeneration is of a particular kind. The cell and nucleus lose their form; the vessels become the seat of an active obliterative endarteritis, and the degree of degeneration of the cancer cells is in direct ratio to the diminution in the lumen of the vessels. Eventually the neoplastic cells disappear, owing apparently to a true cytolysis bringing about their absorption. In the cicatrices Pusey has found only one layer of normal connective tissue covered by a thick epithelial layer, the papillæ having disappeared. According to Pusey the rays act upon the epithelial cells considerably before the vascular lesions occur. He is prepared to admit that these modifications are produced in all the tissues whether normal or neoplastic, but with different rapidity and intensity.

There were at one time doubts as to whether X-rays burns were really due to X-rays or to electrical discharges, to ultra-violet rays, or other accompaniments of the vacuum tube discharge. It is now experimentally proved that they are due to X-rays, although similar inflammatory lesions can be caused by ultra-violet rays.

The action of raying as a cause of metastasis has not to my mind been proved. Degenerative changes in cells and obliterative endarteritis are not, as Pusey points out, changes conducive to the proliferation of the growth. On the other hand, during the process of disappearance of malignant tumours under X-rays, I think I have seen evidence of toxæmia with an occasional rise in temperature, and therefore when under these circumstances a patient

10

complains of articular "rheumatic" pains, it is well to be on the alert.

Finally, comparing 1903 with the preceding year, I think it may be said that in the treatment of malignant growths by X-rays there seems to have been a general advance all along the line, but that no fresh stronghold has actually capitulated to the assault.

Measurement.—In dealing with Röntgen rays, whether for radiographic or therapeutic purposes, the great desideratum is measurement. How are we to know the quantity and quality of the rays we are using? Two instruments have been devised—one a modification of the so-called radio chronometer of Benoist, which measures the penetrating power or *quality:* the other the instrument of Holznecht, which measures the *quantity*. In the first instrument the quality or penetrating power is measured by comparison with a series of relative transparencies of one body to another, *i.e.*, of silver to aluminium. Silver is the standard candle, so to speak, and various thicknesses of aluminium are arranged on a scale for purposes of comparison with this. Thus, supposing that with a certain tube, a certain number on the aluminium scale —say 6—corresponds with the shadow thrown by the silver,—rays that would give this result would be designated in point of penetrating power by the number 6. (Instrument shown in action.)

The second instrument measures the quantity of rays. It is all important in connection with X-ray burns to know the quantity of rays actually absorbed by the skin. The principle is that certain salts assume a bluish-green colour in proportion to the quantity of X-rays absorbed. The colour is appreciated by a standard scale and depends essentially on the quantity of rays absorbed, not at all on quality. The small case containing the salts is placed close to the region under treatment until it has acquired the colour which experience has shown to be necessary for the case in hand. (Radiochronometer shown.)

A third method which has lately been brought to my notice consists in measuring the vacuum of the tube (and therefore the penetration of the rays) by measuring the current going through it. The vacuum is in inverse ratio to the quantity of current as expressed in milliampères. I need not go into the theory of this, but if you read this milliampèremeter now with first a hard tube and then a soft tube in action, you will find that this is the case.

Electro therapeutics.—There has, during the past year, been much active work in electro-diagnosis, and in the study of electrical phenomena connected therewith. In the application of phoretic medication and ionisation, in the employment of continuous currents of high intensity, and of polyphase currents there has been a good deal of experimental work, but nothing in any sense epoch-making. The chief interest has centred in high frequency. I think here there may be noticed a tendency to desert the methods of autoconduction and the condensation couch for the newer method of bi-polar effluvation. This is, as we know, carried out by attaching the patient by an electrode to the upper spiral of one resonator whilst the effluving brush, attached to the top spiral of the other, is moved about at a little distance from the body of the patient. There are other methods of doing this by using each end of a double resonator (experiment).

The condensing couch and autoconduction which the earlier enthusiast thought was going to cure diabetes, albuminuria and obesity, it is needless to say has not come up to early promise. Nothing, however, has occurred to shake our faith in mono-polar effluvation in some skin affections, hæmorrhoids, and anal fissure, and in the general and local treatment of some gastric and intestinal conditions. Comparisons have been instituted between the relative efficacy of high frequency and Finsen light in the treatment of lupus. We know that the discharge furnished by high frequency currents is a source of chemical rays

and that the vaso-constriction caused by sparks is useful in aiding the penetration of these rays, but, in my opinion there is not yet any sufficient evidence that such discharges can hold their own with Finsen light in the treatment of lupus.

There has been some controversy and much justifiable scepticism as to the effects of high frequency currents in lung troubles. I do not know that we are much further forward on this point, but there is some strong testimony forthcoming as to their efficacy in diseases of the trachea and bronchi. The following are extracts from a recent publication of Reus :—

Chronic Bronchitis.—High frequency currents, applied in the form of the effluve, effectually subdue the cough and promote the oxygenation of the blood and tissue metabolism at the same time that they increase elimination. They not only promote general nutrition, but effectually combat the atonic dilatation, which favours a recrudescence of acute catarrh on the least exposure.

Chronic Tracheo-Bronchitis.—In the milder form of this affection Reus confines electrical treatment to local condensation; reserving the effluve for cases in which moist sounds are audible, or the cough very troublesome.

Electrical treatment, by promoting oxydation and removal of waste products, soon exerts a beneficial effect upon the progress of the case. There is usually a general as well as a local symptomatic improvement. Susceptibility to contract colds on the least exposure decreases as treatment proceeds.

The two following cases of Reus' clearly illustrate the relation of the disease to nutritive aberrations, and the technique to be adopted :—

CASE I.—A short thick-set man who had been subject to gout for ten years and who, five years previous to his first visit, had had an attack of bronchitis from which he slowly recovered.—Electrical treatment consisted of applications of the current by the splint-jacket condenser

administered daily during the first three weeks, and then on alternate days for a further four weeks, after which he was perfectly cured.

Case 2.—A cabinet maker, aged 51 years, suffering from what he called rheumatic gout, and also subject to transient attacks of bronchial catarrh and shortness of breath on exertion and habitual cough.—Electrical treatment commenced with a session of condensation lasting five minutes, followed by effluvation of the base of left lung and enlarged joints. The duration of the sessions of condensation was gradually extended to fifteen minutes daily, with applications of the effluve for a further period of ten minutes. After twenty-four sessions the patient was discharged free from all respiratory trouble; he could also eat, sleep and digest well.

Dry Catarrh of Laennec.—The derivation methods, which seem to be the most advantageous in treating this affection, first produce a general improvement in the condition of the patient and an increase in the powers of assimilation and digestion. A diminution in the frequency of cough and of asthmatical orthopnœa is next noticed; but it is long after the symptomatic cure is complete that the excess of resonance, due to over-distension of the air-sacs, returns to normal.

In the case of a patient aged 38 years, suffering from dry catarrh of several years' standing, a symptomatic cure was obtained after four months of treatment; but it was only at the end of nine months that normal thoracic resonance was established. In this case, the patient was placed in derivation upon one pole of the small solenoid, while a roller-brush electrode attached to the other pole was moved over the thorax both anteriorly and posteriorly until a marked revulsive effect was produced (Reus).

Pituitous Catarrh.—In this affection Reus favours local condensation, followed by effluvation. In this way, he says, the circulation and nutrition of the bronchial tubes can be improved, and the elasticity of the lungs greatly increased.

The stimulating and tonic effects of condensation, coupled with the sedative action of the effluve on spasmodic dyspnœa, quickly modify the progress of the more urgent symptoms; but time is required to re-establish the general health. Reus records a case, treated by autoconduction combined with effluvation. The patient was discharged at the end of three months of treatment, free from all bronchial symptoms, although resonance on percussion was still above the normal.

Bronchiectasis.—The therapeutical indications furnished by a study of the disease points to the necessity for combined general and local treatment: this requirement being met by local condensation with effluvation—the local applications being made to the areas in which dilatation of the walls is plainly evident.

Improvement in the general condition of the patient in a great measure precedes that of the local lesion, which, on account of the destruction wrought by the disease, responds more slowly to electrical treatment.

Not the least among the advantages that accrue from electrical treatment is the diminished predisposition to catarrhal affections, which patients suffering from bronchiectasis are always liable to.

In two cases of Reus', a cure was effected after fifty-four sessions and in five weeks respectively.

Bronchial Asthma.—The predominance of spasm as a local manifestation of this disease suggests the utility of derivation methods in its treatment. Local applications of the effluve are of service in cases of asthma caused by nasal obstruction, when the seat of irritation can be traced. Less must be hoped for in the way of combating an acute attack than in counteracting the habit of disease, as it is only when the systemic effects of the currents are actively manifest that a decided improvement in local symptoms can be expected.

Crooneg reports a case which he submitted to derivation treatment. Applications by this means were made

daily to the anterior aspect of the chest and epigastrium, and to the back between the shoulder-blades. After a period of two months (fifty-four applications), the general condition of the patient was much improved.

A last point about these currents is—that they are not to be played with, and the sooner that medical men explain this to their patients the better. It must not be imagined that "if they can do no good they can do no harm." Certain experiments of Bordier and Lecompte during the past year bring out this point very plainly. A rabbit attached by metal collars was put in circuit of the small solenoid (seven spirals of the latter being included) with a man and a galvanometer—the current was switched on showing a strength of 300 ma. At the end of three minutes the current was stopped and whilst the man felt absolutely nothing the rabbit was quite overcome, and was found to be suffering from paraplegia of the hind quarters. Fourteen days after this it died. Another experiment made on a guinea-pig, using buccal and rectal electrode (an arrangement which of course intensified the current bringing it up to 500 ma. or more), it was found that after one minute the spinal muscles were contracted and those of the neck became rigid, and at the end of seven minutes both respiratory and cardiac movements ceased and the animal died. A rat under similar conditions died in twenty-five seconds. It is evident therefore that although the human subject does not feel these currents, still the inference is obvious that they must have potentialities for mischief even in man.

Gentlemen, I have to thank you for your patience and to apologise for the length of this "rapid review."

Original Communications.

THE NEEDS OF THE MODERN HEALTH RESORT*

BY LEONARD WILLIAMS, M.D., M.R.C.P.
Assistant Physician to the German Hospital.

THE claim of any place to rank as a health resort necessarily rests upon one of two things. Either it must possess natural mineral waters of therapeutic value or it must enjoy a climate with some special features of merit. With regard to mineral water stations, their utility depends of course mainly upon the composition of their waters, but it depends also, to an extent, which is not, I think, sufficiently realised, upon elevation, exposure and other climatic factors. The prevailing indifference to the therapeutics of health resorts leads many people, when having recourse to this kind of treatment, to consider the disease rather than the patient; and it is no uncommon thing to find people advised to go to a spa whose waters are quite suitable to the disease, but whose climatic conditions are most inimical to the general condition of the patient. It is necessary to remember therefore, that a spa, though doubtless entitled to rank as a health resort in virtue of its waters alone, must be carefully considered from its climatic standpoint no less than the station whose claim to the title rests altogether upon its climatic conditions.

The first essential of a health resort is therefore a definite and distinct climate, whether this be bracing, sedative or intermediate. And I should like to say here, that in estimating the effects of a particular climate we should not rely too exclusively upon meteorological conditions. What we want to know is, not so much the kind of response which a particular

* An address delivered before the East Sussex Medico-Chirurgical Society, Tuesday, December 15, 1903.

place elicits from a column of mercury, but the nature of the reaction which it will excite in a column of flesh and blood. I should be the very last to say one word to detract from our obligations to accurate meteorology, which are overwhelming; but we should not lose sight of the fact that what we thus obtain are merely the essential factors of a climate, those which enable us roughly to label it, and that to a real estimate of its refinements and possibilities we require observations as to subjective effects. In other words, though it is helpful and perhaps even essential that we should have accurate knowledge concerning the altitude, the temperature, the sunshine, the humidity and so on, of all health resorts, what we want even more are accurate records by unbiassed, healthy people, of the general effect upon themselves of different localities. It is the difference between the results of clinical observation and the research work of the laboratory. In climatology the laboratory has so far had it all its own way, but I hope it will not be long before the clinician succeeds in asserting himself. The task is, of course, a difficult one in many ways, but the chief obstacle arises from the different meanings which various people attach to adjectives. This is a difficulty which pervades not only science but literature. Some of you may remember a suggestion which not long ago came from across the Atlantic, to the effect that when an adjective was used, it should have a numeral attached to it, indicating the degree of the quality to be expressed by the adjective. The numbers were to run from 1 to 100, so that each attached numeral expressed a percentage of the superlative degree of the quality, thus: "She was young (17), and though inclined to be irascible (14), she was for the most part amiable (60), and was certainly beautiful (75). She was also clever (40) and talkative (100)." Attempts have been made by J. W. Osborne* and Professor Abbe† to utilise this method in matters climatological, with

* "Determinations of Subjective Temperatures," *Proc. American Assoc., Adv. Sci.*, vol. xxv., 1876, pp. 66-74.

† *Scientific Record* for 1883, p. 491.

a success, however, which is only partial. The mistake into which they fell arose from an attempt to restrict their observations to temperature alone, forgetting that the effect of temperature upon the body was enormously influenced by humidity, so that any scheme which failed to include the latter must of necessity be abortive. In the January number of the JOURNAL OF THE BALNEOLOGICAL AND CLIMATOLOGICAL SOCIETY, which I have the honour of editing, there will appear a paper from the pen of a layman, Mr. W. F. Tyler, propounding a most interesting and ingenious method for testing and recording the subjective effects of climate, which, if it attains to the general acceptance which it deserves, will help to place climatological observations upon a more "clinical" and therefore a more satisfactory footing.

When we consider how ignorant we are as to the factors which determine the finer differences in climatic effects, it must be obvious not only that further work is wanted, but that this work must be conducted on fresh lines. There are, indeed, not a few even of the grosser climatic truths which we are at present quite unable to explain. Who, for instance, can tell us why some seaside places should be so conspicuously bracing? The factors which go to the production of a sedative seaside climate are comparatively easy to understand; but when we know that altitude is one of the most important factors in the production of bracing climates, how are we to explain the fact that some of our most bracing stations, in that they are situated at sea level, are totally wanting in this factor? Here is a problem before which meteorology is dumb. That the sea-air supplies the bracing qualities is no explanation, because there are seaside places which are as conspicuously relaxing as others are bracing. The degree of relative humidity is doubtless the key of the position, but then unfortunately no one has yet produced a satisfactory explanation of what determines humidity. The meteorological supports upon which we have been accustomed, in matters climatological, to rely, have thus their very definite limitations, and I think we shall

be wise if, in our future observations on these important points, we trust more to subjective and less to objective phenomena.

All this may seem foreign to my immediate purpose, but my excuse for dwelling upon it is a desire to emphasise my original statement, namely, that to be regarded as a climatic station a place must enjoy a climate with some special features of merit, and to insist that such special features, in that they belong to the refinements of climatology, are at present more surely discovered by clinical than by instrumental observation. Pau, for example, meteorologically considered, has few, if any, claims to rank as a winter station; yet no one who has himself experienced its charm, or who has witnessed its effects upon others, would deny its right to this title.

But places cannot nowadays depend upon their climates alone. A climate is a subtle gift of Nature, which to be therapeutically helpful must be abundantly supplemented by the energy, the foresight, and the enterprise of man. Now, among the many fields in which these qualities may display themselves, by far the most important is that of general sanitation. It is of course axiomatic to say that in a station claiming to be a health resort the drainage and water supply must both be beyond a suspicion of reproach; but inasmuch as some town authorities seem to consider that they have done enough when they have afforded facilities for these necessaries, I may be allowed to say that public sanitation is efficient only when it is backed by scrupulous private sanitation. The individual householder is, for the most part, an unhygienic monster who requires to be pursued and worried into doing his sanitary duty by every expedient which the state of the law permits. The unit of sanitation is undoubtedly the individual house.

The mention of the individual house brings me to that portion of general hygiene which is crying loudly and ever more loudly for adequate notice; I mean the question of ventilation. If I had to say what I regarded as the most

important need, not only of health resort towns, but of all towns wherever situated, I would reply unhesitatingly that this need consisted in statutory powers for dealing with inadequate ventilation, both in public buildings and private houses, on the same drastic and peremptory lines which now characterise municipal powers in all matters referring to drainage and water-supply. The ordinary citizen has had flushed and ventilated drains and pure water imposed upon him sorely against his will, and even now, when the Public Health Act of 1875 has been in operation for all these years, it is no uncommon thing to find even educated people who stigmatise sanitary activity in vigorously uncomplimentary terms. In the matter of fresh air and its blessings, and foul air and its manifold dangers, our friend the ordinary householder will, it is to be feared, be even more difficult to convince; for not only is there his initial obstinacy and inertia to overcome, but from the fact that he has been brought up to fear a draught as he fears nothing else on the earth or beneath it, there is a great deal for him to unlearn before his education can begin. The sooner this education begins, however, the better will it be for the health and physique of future generations. I shall refer to this matter of fresh air again presently, but I should like to say here that the educational process ought to be inaugurated by reforms in the local authorities themselves, for in my experience the buildings belonging to the corporations in most health resort towns, their assembly-rooms, their pump-rooms, their winter gardens, their kursaals, are the hottest, the stuffiest, the worst ventilated buildings to be found outside London.

In the same way that no place can afford to depend upon its climate alone, so no resort can afford to depend upon its natural beauties alone. The modern health resort must have attractions; that is to say, it must offer to its visitors opportunities for spending their time agreeably and rationally. Upon this point everyone is agreed; the abstract proposition finds unanimous favour. It is only when we descend to details that differences become apparent.

Now these differences seem to me to arise from a confusion in the minds of the disputants as to what a health resort ought to be. There are on the one hand, those who maintain that it should be a sort of play-ground for the healthy, a place that is, where good health may be maintained, where holidays may be profitably spent. There are on the other hand, those who regard the health resort as a therapeutic instrument, a place where the delicate may be made strong, where the convalescent may recuperate, where disease may be actively combated by means and under conditions not to be obtained in the great centres. There is, in reality, nothing in the least antagonistic in these two views; for although there can be no doubt that a health resort is primarily a place for those whose health has become impaired, and who, therefore, require medical supervision and treatment, yet it is to be remembered that invalids have relations and friends who are not in want of treatment, and who therefore naturally enough demand some of the play-ground element. Moreover, as invalids improve, they themselves are benefited by a liberal allowanec of this element, and are much more likely to prolong a stay which is rendered attractive and agreeable than one which is baldly and crudely curative. There is no complaint which is more constantly, more forcibly, and alas, more truthfully urged against British health stations than that they are appallingly and incurably dull; and I am free to confess that the miseries of a severe illness would be increased an hundredfold for me by the thought that my convalescence might have to be spent in the dulness, the solemnity and the oppressive respectability of the ordinary English seaside lodgings. What we require at our health stations is "more life and fuller." Wherein this consists is a problem presenting apparently insuperable difficulties to the genius of the British nation. And yet its solution is writ large on every continental seaside place from Blankenbergh to Biarritz. The point which it seems to me that we miss is the application of the truth that man, especially the health resort frequenting man, is a gregarious animal. We not only

fail to force him into the company of his fellows as they do abroad, but we actually place difficulties in the way of his meeting them. We offer him no regular attraction at a given place at a given hour, a *rendezvous* where he is more or less obliged to go, and, going, to meet friends and make acquaintances and pass the time agreeably and pleasantly. At spas such a *rendezvous* is supplied by the pump-room, but at English spas, this institution is so ill-ventilated and its ritual so unattractive that the wise man departs from it at the first possible moment. At continental seaside places in summer time the beach is the *rendezvous*. Here not only do we find bands playing, but there is that mixed bathing which some people in this country find so shocking. Now whatever else may be said about mixed bathing, there is no doubt that it constitutes a daily attraction both to the bathers and the onlookers, so that the beach at the fashionable hour is a bright, amusing, agreeable spot to which every one is glad to repair.

But, granting that mixed bathing is an impossibility in this country, and recognising that there are many health resorts where a pump-room does not exist, there are still means by which the principles underlying the *rendezvous* system may be made effective. Now what are these means? The first essential in my judgment is that the *rendezvous* should be in the open-air; the second, that it should be fully exposed to the sun; and the third, and by no means the least important, that there should be adequate facilities for providing full shelter from the force of the various winds. Such a place should not only be a lounge but a promenade; it should not only have comfortable seats, but should be sufficiently extended for people to walk about without feeling and looking as if they were caged animals. Add to this the attraction of a really good band, means for obtaining tea and other light refreshments, and facilities either for buying or borrowing some light literature, and there are the essentials for giving that cohesion and interest in the life of a health resort, the absence of which are now so greatly

deplored. I should, like however, to insist for one moment upon the necessity of the open-air character of such a place. The modern conception of phthisis has taught us many things. It has taught us not only how to treat tuberculosis, and how to prevent its occurrence, but it has opened our eyes to the prophylactic and curative value of fresh air and sunshine in every department of medicine. The *rôle* of the health resort in the future will be that of encouraging Nature's remedies for those ills which are inseparable from the strenuous and unhealthy lives of town dwellers. The health resort treatment of the future will be an open-air treatment, an open-air treatment modified and softened no doubt from what some regard as the rather Spartan *régime* which we now recognise under this title, but still a real open-air treatment in which fresh air and sunshine will be allowed full opportunity of working their remedial and beneficial effects.

It is not easy to over-estimate the importance of this feature in considering the future of our health resorts, for not only are those stations which fail to realise the strong set of the tide in this direction, destined to fall behind in the struggle for existence, but there is a rich and well-deserved harvest awaiting those which shall prove themselves pioneers in the matter. Amusement, distraction, opportunities for making friends and conversing with acquaintances there must be, but even more important is it that these opportunities should be in the open-air and the sunshine. The days of the pretentious and meretricious crysto-palatial winter garden are gone as surely as those of the unspeakable Assembly Rooms, in which our forefathers exchanged their polite bows and their pathogenic germs. Nor can the existence of the ridiculously diminutive and frequently verminous shelters which I see dotted about on otherwise magnificent esplanades, be regarded as any serious contribution to latter-day requirements. These things are not only useless, but they are frequently insanitary, and worst of all they seem to act as an anodyne to the municipal conscience, in affording an outward and visible sign that something is done in the interest

of invalids. The esplanade should of course have shelters in profusion, and not only the esplanade, but the public parks, gardens and walks; but such shelters should be so constructed as to meet any emergency of wind and weather and should be properly supervised and efficiently tended. The paramount need for abundant facilities for being in the open-air with comfort and pleasure may be summed up by saying that it is useless to send a patient for climatic treatment to a place where he is unable to take full advantage of the climatic merits which the place affords. The climate of the ordinary hotel or lodging-house is, unfortunately, just as unsatisfactory at Buxton or Harrogate as it is in London.

The next point to which I would allude is the necessity in the modern health resort for completeness of equipment for various kinds of treatment. I said at the outset that no place can afford to depend upon its climate alone, and I have referred to the desirability of development along certain lines; the necessity for sound sanitation, the importance of amusements and brightness, and the need for abundant facilities for spending as much time as possible in the open. I would now go further and say that the modern health resort cannot afford to depend upon climatic treatment alone. We have got beyond the stage of regarding climatic treatment as synonymous with the treatment of phthisis, and we now recognise that there are a great many morbid states which are conspicuously benefited by a sojourn in a suitable climate. Now, these morbid states, almost without exception, are such as demand treatment by methods other than climatic, and unless these other methods are to be obtained at a given place, not only does that place fail to get the patient, which is a serious matter enough, but what is infinitely more serious is that, in order that he may obtain the benefit of these methods, the physician is obliged to send the invalid to a climate which is not altogether satisfactory.

Let me give you a case in point. A short time ago a medical friend sent me a patient for advice as to the most suitable place for her to winter in. She was a highly neurotic

lady with definite signs of commencing rheumatoid arthritis. Now, of the places which, climatically considered, I regarded as most suitable for her general condition, not one was able to afford her the balneary treatment by which the management of her joint symptoms could be rendered so much more rapid and efficient than it could be in the absence of such treatment, and I was therefore obliged to send her to a station which from a climatic standpoint was much inferior to those which I have indicated. It was a choice of evils and I hope and believe that I selected the lesser.

But my point is that difficulties of this kind ought not to arise. If I want to send a patient to a well-established climatic station, whose general conditions are suitable to the case, I ought not to be forced into a decision against that station by the knowledge that it is impossible to obtain Nauheim Baths, douches, massage and similar forms of treatment, any one of which may be essential to the adequate management of the case. Of course such difficulties are inevitable in some places, but in the larger stations, especially in the larger seaside towns, they ought not to exist. I may be asked what can be the use of attempting to remedy such defects in places where there is no natural mineral water. To this I would reply that the sea offers an inexhaustible supply of one of the strongest and most curative mineral waters in all nature, and it seems to me astounding that of the numberless climatic resorts along our coasts, so few, comparatively, so very few, have seen fit to utilise it for purposes of scientific balneology. An institution where sea-water may be employed for similar purposes and according to the same methods as the waters of Buxton, Bath and Harrogate, is by no means necessarily an expensive matter, and its absence at the majority of our seaside stations constitutes a serious drawback to the full utilisation of the climatic virtues which these stations possess. I am aware that certain of the therapeutic methods for which I plead are to be found scattered about some of the larger towns. The Nauheim baths and exercises for example, and the

Dowsing Radiant Heat baths, I know to exist in many health resorts, but they are for the most part hidden away either in nursing homes or in the houses of individual medical men. This kind of thing is, of course, very unsatisfactory from many points of view, but from the standpoint of the physician at a distance, it is absolutely useless. What he is, of necessity, forced to rely upon in such matters, is the existence or non-existence of a public institution; and if there is no public institution to which his local medical friend can send the patient with the same certainty of his directions being carried out as when he prescribes a mixture for the chemist to dispense, then he regards the particular form of treatment of which he is in search as unobtainable. The modern health resort cannot afford to depend upon climatic treatment alone. The possession of a good climate should be an incentive to the authorities to strive after completeness, to afford facilities for the supplementary treatment of the various diseases for which the climate is beneficial, and such completeness cannot be attained by any place which fails to recognise the great and increasing importance attaching to balneary and allied methods in modern therapeutics.

Before concluding this rapid survey, I cannot refrain from making some observations upon the great influence for good or evil which the members of the profession practising at a health resort may exercise upon its future. The medical men at such a place are, or ought to be, the experts on all matters pertaining to its corporate welfare. That they are sometimes not so regarded is in a measure their own fault, and I should like, while disclaiming all intention of what might justly be regarded as the impertinence of lecturing you, to make some suggestions on this point. First then, I would venture to say that health resort practitioners should take the health resort aspect of their work more seriously than they at present appear to do. They should make it their business to meet together, not only to discuss matters connected with the place and to give effect to their conclusions by arranging to be adequately represented on the

governing body, but they should learn a lesson from the large continental stations by arriving at definite conclusions as to the *régime* to be followed by invalid visitors. It is, I know, easy to object that every case is to be treated on its merits—an abstract and elementary proposition which no one will controvert—but this is in no sense a reply to my complaint that in several matters in which there might be unanimity, and in which on the continent there is complete unanimity, there is in this country only confusion. Such unanimity begets confidence and its absence begets distrust. One of the most important of these matters is diet. There is no more common and constant source of want of success in climatic treatment with us, than failure to recognise the great and important differences in dietetic needs and tolerances induced by differences in climate. Now, if there is one subject upon which local medical men might be expected to speak with one voice, and that an authoritative one, it would be the dietetic requirements of their particular locality. Abroad they do this invariably; at home, never. I am very far from advocating the cast-iron militarism of treatment which obtains at some of the German stations, but I do most strongly urge agreement upon the leading lines of treatment, the modifications from the ordinary life, which a particular climate necessitates, not in invalids only, but in anyone visiting the place. It may be that abroad they do too much in this direction; there can at any rate be no doubt that at home we do too little.

I repeat, therefore, that health resort work to be done properly must be taken seriously. Too much reliance must not be placed upon the influence of climate alone, but the qualities of an individual climate should be studied in relation to its effects upon all the details of life, the diet, the exercise, the amount of sleep, the reaction to drugs and other methods of treatment, for the more I see of different localities, the more convinced do I become that no two climates are exactly alike. They may resemble one another closely, as some human beings do, but like human beings,

each one has its distinctive features which confer upon it a character, a personality all its own. It is these distinctive features which we now feel the necessity of reading, of understanding, and of turning to therapeutic account, and we look to those who have the opportunities, to take those opportunities seriously by co-operating in the study and differentiation of these important matters, so that climatology and health resort treatment generally, by becoming more precise, may take that place in rational therapeutics to which its merits undoubtedly entitle it, and which the general trend of modern thought is increasingly disposed to assign to it.

JAMAICA AS A HEALTH RESORT.

BY ERNEST E. LEWIS, M.D.

IN the following paper I propose to lay before my readers some facts concerning the climate of Jamaica.

There are many signs that the tide of fashion is turning towards this island as a winter residence, and it is well that we should examine dispassionately the assertion that Jamaica has a future before it as a health resort, and judge for ourselves what grounds there are for a statement which is contrary to our traditions.

Though one of our oldest colonies, the scientific data are but limited, the impoverishment of the island having necessitated the curtailment of expenses in every direction. For the sake of economy, no census was taken in 1901, and the post of Meteorologist was merged in that of Island Chemist. Jamaica as a health resort must be regarded as a new country, and as such has few statistics to offer.

But the proportion of black and coloured to the white population is so large that it would be misleading to consider the vital statistics as a whole, unless the characteristics of negro life were dealt with also.* Such being beyond the scope of the present paper, I shall confine myself to those points which bear on the question of the suitability of Jamaica as a health resort for English people.

We are slow to shake off the remembrance that in the eighteenth and early part of the nineteenth centuries Jamaica stood second only to West Africa in its reputation as the white man's grave.

Probably the drunkenness, immorality and sanitary ignorance of our ancestors when carried into tropical surroundings were sufficient to account for the tremendous death-rate

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* The estimated population in 1902 was 763,545; of this number only about 14,000 were white.

amongst the white soldiers. With regard to the mortality amongst the civilians, investigation proves that the larger proportion was amongst the book-keepers, a class of young, immature men sent out from England on the chance of making a fortune. The sugar estates on which they were chiefly employed lie in the lowlands, where the fertility of the land is largely reinforced by the decaying vegetable matter brought down by the torrential streams from the hills above. The habits of life in those days were anything but conducive to the health of young unacclimatised persons residing in situations such as these.

But the stability of the climate being one of its chief characteristics, I have always felt that either there was some discrepancy between the then prevalent idea of the climate and the actual facts, or else that Jamaica is in danger of being as much over-rated in the present day as it was abhorred in the past.

It is more than likely that we shall find the explanation of this difficulty in the fact that the white overseers deliberately promoted the idea of the unhealthiness of the climate.

Every proprietor was by law obliged to maintain one European overseer to a certain number of slaves on each estate. The proprietors were mostly non-resident, and the overseers were anxious that they should remain so. Had the owners returned a check would have been put on a system which was a source of wealth to the overseers at the expense of the absentees. It was therefore represented to the owners that the climate was deadly, that it was impossible for a white man to work in the Island, and, moreover, that it was dangerous for a European to reside there.

They were anxious to prevent the proprietors from coming to live on their estates, and, strange to say, the owners never seem to have reflected that, if the white overseers could reside for years in the Island without any ill effects beyond those of too much rum, they themselves might make the venture.

I am not alone in the opinion that misrepresentations of the climate were deliberately made. This same view was

brought prominently forward in a paper read before the Royal Colonial Institute some years ago by Dr. Logan Russell, who, with his father before him, has an intimate knowledge both of the history and climate of Jamaica.

The mortality amongst the soldiers admits of no doubt; but large bodies of men living in ill-ventilated, over-crowded and insanitary barracks in a tropical climate, with an unlimited supply of rum at hand, will produce a death-rate of astonishing proportions. In this instance the climate was directly condemned as the sole agent of the evil, while the other factors in the case were ignored.

Lemprière, in his observations on the diseases of the Army, published in 1799, also indirectly corroborates the statement that a false idea of the climate was promoted. In speaking of the expedition into the interior of the island to put down an insurrection of the Maroons, he says :—

"During the whole of the seven months' campaign the troops were remarkably healthy, though they were constantly harassed by the most fatiguing marches over stupendous mountains and almost inaccessible places, exposed to perpetual rain and frequently obliged to sleep in the open and in wet clothes."

These are the very conditions calculated to produce the worst effects if the climate were unhealthy in itself. But we find that the men, though exposed to great hardships, were in better health than when in barracks. The same authority goes on to say :—

"After the expedition terminated four companies of the 83rd remained at Maroon Town and enjoyed a better state of health than they would have probably experienced in Europe, and for a period of two months the hospital was closed, the detachment not furnishing a man whose indisposition was such as to require confinement."

In view of these facts we are justified in concluding that the climate was not solely responsible for the heavy death-rate in old days, but rather that it was largely due to overcrowding, insanitation, immorality and drunkenness.

The following authentic story gives positive evidence as to the suitability of the climate for Europeans :—

"Eight men met in Jamaica. One said, 'Who says Jamaica is unhealthy?' For answer they made a list of themselves. Three were white men born in the Island; their ages were 86, 79, 71. The others were born in the British Isles, only two of them being under 70."

None had been less than forty-three years in the Island, most had been fifty. Their united ages amounted to 579 years. Before they died the amount must have exceeded 600 for the eight individuals.

We may now consider some elementary facts regarding Jamaica, so as to have a clear view of the whole situation.

It is the largest of the West Indian Islands belonging to Great Britain, but is considerably smaller than Cuba or Hayti. It lies some 5,000 miles to the south-west of us, and is reached in twelve or sixteen days from Bristol or Southampton. Messrs. Elder Dempster's line goes direct from Bristol to Kingston once a fortnight, and the Royal Mail line starts from Southampton the alternate weeks, calling at Barbadoes *en route*. The voyage is long enough to enable travellers to get accustomed to the sea, but yet not long enough to become wearisome. Both lines are well found and admirably suited to the requirements of travellers, the Bristol line having the advantage of the shorter voyage, while the Southampton line is the first to reach a temperate sea.

The situation of Jamaica extends from 17° 43′ to 18° 32′ north latitude, and from 76° 11′ to 76° 20′ 50″ west longitude.

It is thus well within the tropics, but its climate is not torrid, and it has the well-known equability of most island climates. It is protected from exposure to the open ocean by the outer ring of the volcanic West Indian Islands and by the continents of North and South America. But it lies in no land-locked bay, as the nearest mainland is between 300 and 400 miles away.

It is not volcanic in its origin, but probably at one time

formed part of the American continent. There are, however, traces of volcanic action at the eastern end of the Island, though no defined crater.*

The general basis is formed by igneous rocks overlaid by several distinct formations, the white and yellow limestones being most prevalent. The soil is generally porous and underground rivers are a marked feature.

The name "Jamaica" is formed from the old Indian name signifying the land of springs, or the land of wood and water. It is no misnomer, but gives a true idea of its luxuriant beauties, which are now becoming known to an increasing number of travellers.

The length of the Island being only 144 miles, and its greatest width forty-nine, and its least width twenty-one and a-half, it will be understood that the difficulty of getting from one part to another is not one of distance. Its surface is extremely mountainous, and this fact is of the utmost importance in considering it as a health resort.

The rapidity of elevation makes a diversity of temperature accessible in a journey of a few hours, while the formation of the hills makes every aspect of the compass obtainable. The chief range is that of the Blue Mountain, the highest point of which reaches 7,423 feet.

We shall realise the steepness of the Island best by comparing it with Mont Blanc. The Blue Mountain Peak is not quite half the altitude of Mont Blanc, but it reaches that height in about ten and a-half miles from the sea, as measured on the map, and as the whole Island only amounts to about the size of Sussex and Kent put together, the climatic circumstances are largely influenced by this remarkable and rapid elevation.

The backbone of the Island runs roughly from east to west, with ribs running north and south. These ribs in

* I am told that some of the hot springs went up to boiling point at the time of the recent eruptions in St. Vincent and Martinique, but there was no other sympathetic disturbance, and we must remember that those unfortunate islands are nearly 1,000 miles away.

turn give off spurs in every direction, so that the country is cut up into a series of ridges with intervening gullies, thus enabling us to command every aspect with protection or exposure to the sun and winds as desired.

Out of a total area of 4,207½ square miles nearly *half* is more than 1,000 feet above the sea.

A small island with this great elevation situated in a tropical sea naturally has a heavy rainfall. The mean for the whole Island was 66·54 during the ten years ended in 1889, and 76·15 in the same period ending in 1899, but this is a case where figures are deceptive.† It is a remarkable fact that, while the temperature throughout the island is peculiarly uniform, the rainfall presents the greatest diversity.

Certain portions contribute so largely that the average works out at a high figure, while other portions may justly lay claim to possessing a dry climate.

Fortunately these conditions are fixed, and we run little risk of finding much variation in the rainfall for each class of situation.

The fact that the greatest elevation of the Island is towards the eastern end is of extreme importance in determining the climate. The Blue Mountain stands as a great bulwark against the perpetual onslaught of the trade winds, which deposit their moisture in constant rain upon its face, and pass on to the hinder parts of the Island deprived of vapour.

Had the mountain stood at the western end of Jamaica, the passage of the winds across the Island might have been described as wet, wetter, wettest, but, thanks to the situation of the mountain so justly celebrated for the beauty of its scenery, the country to its rear possesses a dry climate.

The rapidity of elevation and the number of cross ranges results in the rivers being mostly short and torrential in character, and, though there are certain patches of swamp scattered about the Island, they occupy an inconsiderable area and are easily avoidable. Many of the rivers disappear

† See rainfall tables at end of this paper.

into sink holes and pursue their course for a considerable distance underground.

The winds blow with such regularity that, given the month and the time of day, we can calculate with accuracy what wind will be found prevailing.

In the time of the Spanish occupation, which ended more than 200 years ago, the daily wind from the sea was called "el Medico," and it still performs its healthful duty with such regularity that we, too, call it "the Doctor."

Then with equal regularity the wind blows from the land at night, and the great height of the mountains gives Jamaica the invaluable possession of cool nights. Not the freezing nights in contrast to the scorching days of a great *continent* like South Africa, nor the bitter winds from the snow-covered mountains—the *tra montana* of the Riviera—but the cool wind from the great mountain of a tropical *island.*

There is no need to enlarge upon the restorative effects of cool nights upon the dweller in tropical latitudes, whether he be sick or whole.

The velocity of the wind is also considerable, reaching an average of 89 miles *per diem* during a period of observation extending over ten years.*

Jamaica being in the tropics the temperature is, of course, high, but it is remarkably equable throughout the whole island, and the range of the thermometer is very small all the year round. The greatest diurnal range occurs in the lowlands, where it averages between 15° and 16°, the mean maximum being 83° to 86° during the day, and the mean minimum 68° to 70° during the night. We must remember

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* In the Jamaica Meteorological Reports the velocity of wind is calculated *per diem.* No explanation is given for the departure from the usual rule of calculating per hour, but no doubt the marked periodicity of strong breeze and dead calm characteristic of certain hours of the twenty-four would be lost if the velocity were reduced to its customary formula. To say that the wind blows about 3½ miles an hour gives an erroneous impression: it blows from 4 to 9 miles at certain times of the day, and at intermediate times there may be dead calm.

that these figures are for the whole island and the whole year, and must be much reduced for those places and those months suitable for invalids.

In the mountains the temperature varies according to altitude and exposure to north winds, but the diurnal range is considerably less than that in the lowlands. At the Government Cinchona Plantation, 4,907 feet above the sea, and about thirteen miles from Kingston, the daily range is about 11°. As we ascend the mountains the temperature of course decreases and the rate of decrease is very similar to that which prevails in most countries, namely, about 1° Fahrenheit for every 300 feet of elevation. The humidity at Kingston amounts to about 77°.

In the mountains the rainfall is chiefly controlled by the position of the ranges. As a general rule, the central backbone attracts the chief amount, leaving the lower cross and parallel ranges dry. Dr. Buckley, in his interesting paper "On the Local Factors influencing Climate, with especial reference to Subsoil," read before this Society on January 28, 1903, raises the point that the humidity of the atmosphere is largely influenced by the character of the subsoil. He would find much to confirm his view in the characteristics of Jamaica.

In fact, although possessing a heavy rainfall, parts of the island are subject to droughts from time to time, owing to the declivity of formation and the porosity of the subsoil which tend to too rapid drainage. The underground rivers to which I have already alluded as a feature of Jamaica, contribute to the same effect. But though vegetation may suffer from want of rainfall, it is obvious that there is a magnificent water supply within the island, and by mechanical means of storage any amount can be obtained for personal use.

The rapid absorption by the soil below and the rapid evaporation caused by the brilliant sunshine above are, I think, responsible for the effect described by travellers as "air like champagne." Of course this does not apply to every part of the island alike, and we must not take Kingston,

which lies on the sea coast, as an ideal place for invalids, although from the gravel soil on which it is situated it is now one of the healthiest seaports in tropical latitudes.

Perhaps I should here mention that the death-rate for the whole island for 1902 works out at 21·9. I do not think this is a high figure for a tropical country when the large proportion of persons ignorant of sanitary matters is taken into consideration. It is outside the scope of the present paper to deal with the characteristics of negro life which affect the death-rate. But there are two points which should, I think, be touched on in considering Jamaica as a health resort. The total number of deaths in 1902 amounted to 16,756; of these 1,148 were due to phthisis. I cannot do better than quote the report of the Island Medical Department for March, 1902, on this subject: "The native, when attacked by pulmonary trouble, offers little resistance to the progress of the affection and responds indifferently to treatment. Consumption continues to contribute high figures to the island's death roll. The susceptibility of the humbler classes, their unsatisfactory domestic life, their exposure during seasonal rains, their indifference and neglect when first attacked, all prove active factors in promoting this grave affection. The disease once acquired is readily communicable and spreads rapidly in those poor tenements, which usually consist of one small unventilated, badly constructed hut, the living abode of several members of a family from which the sunlight, our most potent sanitary agent, is rigidly excluded." It is plain from this statement that the death-rate from phthisis need in no way deter Jamaica from becoming a health resort for Europeans, the conditions stated prevailing amongst and affecting the humblest classes only.

The other item to which I would refer is the high mortality amongst children, which likewise finds its cause in the lowest ranks of the people. In 1902, children under one year furnished a percentage of 30·5, and under five years a percentage of 44·9. A large percentage of the births being

illegitimate, the death-rate may be expected to be abnormally high. An additional cause may be found in the heavy manual labour by which negro mothers earn their living. coupled with the absence of home care and complete ignorance of sanitary matters.

Taking into consideration these causes which do not affect the winter resident, we find that the death-rate from other causes is remarkably low, and if the death-rate of children was not so large the total would be below the rate for the United Kingdom during the last twenty-five years; as it is, it is only 2·4 per 1,000 in excess, a figure which testifies to the healthiness of the climate.

The number of persons living to extreme old age (95 and upwards) is exceedingly large.

But although Jamaica is naturally a winter resort, it is also a climate where English people can live all the year round without any ill effects. There is no necessity for children to be sent home, as from India, for they can be reared in perfect health, though perhaps their mental grit may not be so well developed in that genial air as in our own more disagreeable climate, which trains England's sons unconsciously in the power of dealing with the unexpected.

For the purpose of meteorological observations the island has been divided into four divisions. The southern division is undoubtedly the driest, the rainfall during the six winter months averaging two inches per month. The weather reports have been issued with great care for a considerable period by Mr. Maxwell Hall, the late Government Meteorologist. It is worth remarking that the forecasts have been verified to the extent of 80 per cent. Mr. Maxwell Hall attributes this high percentage partly to the use of the spectroscope. He says that, besides the vapour bands in the Red, we have in Jamaica a very strong band in the Blue, which Professor Piazzi-Smith, in his work on the Solar Spectrum, has named the "Jamaica rain band." The reliability of the forecasts is of considerable importance to those in search of health; a tropical shower is no light matter, and

a wetting is to be avoided above all things by unacclimatised persons.

As a general rule, the traveller times his visits between November and April, the dry and cool season of the year; but there are two rainy seasons—May and October—from a fortnight to a month in duration, when one-third of the rainfall of the year is precipitated (see table, p. 174).

Jamaica is outside the usual track of cyclones, but should one occur, as unfortunately happened on August 11 last, its advent can generally be predicted. But the winter visitor may leave cyclones out of his calculations altogether, as their season is confined to the month of August. The last took place in August, 1886, and the lapse of seventeen years without one is a proof that the idea of their frequent occurrence is erroneous.

There is one special direction in which the resources of Jamaica require development at the hands of competent persons. I refer to its mineral springs, of which tables are given below.

In the old prosperous days, a hundred years ago, the spring at Bath was as fashionable a resort for the white residents in Jamaica as its namesake in England, though at present the accommodation at all these springs is scarcely suited to the class who can afford to travel as far as Jamaica in search of health. But the knowledge of the existence of these valuable springs will lead to the necessary improvements in the near future; for there are already public institutions at Bath and Milk River, and a Commission is now sitting to inquire into the matter

The waters at Bath possess the same mineral constituents (but in larger quantities) as those of Aix-la-Chapelle, Barèges and Bagnères de Luchon. They are very similar to those of Eaux Bonnes and Eaux Chaudes in the Pyrenees, and to those of Harrogate, which, however, are cold (while these are hot). They contain the double sodic and calcic sulphuration—that is to say, that the sulphur which mineralises them is found first combined with soda as sulphuret of sodium,

and second, with lime, in the form of sulphuret of calcium. The double sulphuration is most rare. The quantity at present collected amounts to about twenty gallons a minute, while approximately 200 gallons a minute runs to waste.

Bath is about forty-five miles from Kingston on a main road, and can be reached by coach or buggy, or by steamer to Morant Bay, about ten miles distant. The spring at Milk River, in the District of Vere, claims to be one of the most remarkable in the world. It is a saline purgative spring with a temperature of 92° F. It is most useful in the cure of gout and rheumatism, and in cases of disordered liver and spleen.

There are other valuable springs in the island, but it would be best that efforts should first be concentrated in putting these two into thoroughly satisfactory order.

In old days the Government spent considerable sums of money on the upkeep of these baths, but such support can no longer be expected, and we must look to private enterprise for their development. They would make the fortune of any continental town, and now that communication is so rapid and convenient between England and Jamaica, energy and capital alone are needed to bring the accommodation up to modern requirements and to establish a world-wide reputation.

It is no mean advantage to the invalid to be able to obtain these waters in a land where English law and customs prevail, where England is looked upon as home by all around, and where the scenery is amongst the most beautiful in the world. I am aware that there is a natural prejudice in the minds of most of us against a race of another colour, and an invalid may naturally possess it to an exaggerated degree. But my own experience teaches me that the casual visitor has little to fear on this account. It is those who have to live, year in, year out, dependent on black labour, who feel the weaknesses of the negro race the most; but to the temporary visitor they appear as a laughter-loving race, a not unwelcome contrast to the more strenuous peoples of the north,

and if they are treated with kindness and patience they will respond accordingly. Children they are, and as children they must be treated, and one-half of our West Indian troubles might have been avoided if we would recognise the fact that the development of a race can only be attained in the course of centuries.

With regard to the special places to be recommended as a residence during the winter months, I have already mentioned the southern division as the driest. In this division we find the St. Catherine, Clarendon, Manchester and St. Elizabeth ranges, which possess a most delightful climate. A cross range of the St. Elizabeth mountains, Santa Cruz, has one of the driest climates possible at the height of 2,500 feet above the sea. It has a mean annual maximum temperature of 75·3°, and a mean annual minimum of 66·8°, with a rainfall of 38·25.* The soil is dry, with a porous limestone beneath, through which the rain quickly disappears. According to Dr. J. H. Clark, for many years in practice in this neighbourhood, the climate of the Santa Cruz district is very similar to Algiers, with the additional advantage of the altitude.

Then there is Mandeville,† which may not possess quite so dry an atmosphere as the last named, but is nevertheless admirably suited to anyone in search of a refuge from cold winds and fog. The climate during December, January, February and March is almost an ideal one. The place stands on a plateau about 2,400 feet above the sea, in the midst of the most beautiful country, is easily accessible by rail from Kingston, and with its old-fashioned green and fine church forms a most picturesque village which seems quite homelike to the English visitor. It is one of the best places in Jamaica for invalids, on account of its level situation and excellent driving roads. Many other places which

* See note p. 170.

† Santa Cruz and Mandeville both escaped damage from the recent cyclone.

12

possess a charming climate are only suited for those in good health because they are perched on the side of a hill so steep that riding is the only means of locomotion. The main roads of communication throughout the island are, however, well engineered and thoroughly kept up. The hedges are chiefly of cactus and wild hibiscus, and the temperate climate is proved by the growth of English and tropical flowers side by side.

Frost is unknown, though it is sometimes cool enough to make a fire in the evenings acceptable. Riding and driving, tennis, cricket, golf and pony racing, provide amusement for those who desire it, so that the visitor will not find time hanging heavily on his hands.

Moneague is another place which deserves attention as a health resort, but space does not permit me to enter into details of this and other places suited for the treatment of special diseases. Speaking generally, however, one may say that the elevated parts of Jamaica are well suited for the open-air treatment of phthisis, the temperature never being excessive and the range small, the air and soil dry, and the surroundings most beautiful.

Kingston is too hot for newcomers to stay in for more than a few days on arrival, but the Constant Spring Hotel, a few miles up country, which can be reached by electric tram, offers a good head-quarters at first.*

It is desirable that invalids should receive local medical advice on visiting a fresh country, and especially when that country is a tropical one. Persons travelling quickly from England do not realise the changed conditions; they do not calculate the rapidity with which night comes on, and must be specially warned against chills, fatigue and over-exertion. With the disappearance of the sun the wind blows cold from

* It is unfortunate that figures for the places best suited for invalids are not at present tabulated in a convenient form, the marked diversity in rainfall not being sufficiently shown by the four large divisions of the island. For instance, the total rainfall for the island for the ten years (1880-90) works out at 66·30, while Kingston shows 32·54. Other places would come out equally well.

the mountains; and the inexperienced visitor is liable to be caught in a heated state perhaps, if he has not been warned. Chills of this character are serious and have gained for the mountain wind the name the "Undertaker," on account of its effects on those who do not take precautions against it.

Visitors should also avoid undue exposure to the sun; even if the temperature is not very high the vertical rays of a tropical sun are very different in effect from those of a higher latitude, and a sun-bath cannot be indulged in with impunity by unacclimatised persons.

The secret of what to avoid is summed up in the word "excess," whether it be in food or drink, heat or cold, fatigue or idleness. Self-control must be exercised, or Nature will exact the penalty for breaking her laws, with a promptitude which is not so plainly visible in colder climates.

For those who visit Jamaica in search of health it is also particularly desirable that they should obtain local medical advice, as the formation of the island results in such a variety of climates that local knowledge is necessary in selecting a residence. A case of chronic rheumatism has lately come to my knowledge which derived great benefit from the waters at Milk River, but as malaria was contracted during the visit it might be looked upon as a choice of evils. I found on investigation that the waters were taken during the months of April and May. These months and June are well known in the locality as the mosquito months, and should be rigorously avoided till such time as the *Anopheles* have been exterminated (a process which, after reading Sir W. MacGregor's report on Ismalia and the Campagna,† does not appear to me to be very difficult of accomplishment, Milk River being situated close to salt water and at a sufficient elevation above the sea). This is a case which illustrates the need of local advice, which would have obviated the mistake of going to the Milk River or Bath at the wrong time of year.

† Parliamentary Papers on the Investigation of Malaria and other Tropical Diseases. C. D. 1598.

Reliable medical advice is to be found throughout the island, which, for medical purposes, is divided into some thirty-five districts, each having a resident medical officer appointed by Government. A rough computation gives the result that no place is more than eight miles from a resident medical man, a fact which is of considerable value in considering Jamaica from the invalid's point of view.

Although Jamaica is not a large island, the ravines and cross ranges make the distances considerable, but the main roads are excellent and the railway brings the central, western and northern districts in touch with Kingston.

The water supply is generally excellent, malaria is confined to certain parts, and yellow fever, that bugbear of the West Indies, is practically unknown to arise *de novo;* although from time to time a case may be imported, it does not spread, and there has been no epidemic for many years.

The hotels and boarding-houses are convenient, and great improvements are being made to meet the increased demand.

The following are some of the cases which may derive benefit from a sojourn in Jamaica during the winter months: forms of pulmonary tuberculosis where the constitutional predisposition to the disease is marked; chronic bronchitis; asthma when not complicated with bronchitis; heart disease, when not complicated with dropsy; certain forms of anæmia and chlorosis; renal disease; sufferers from gravel; convalescents from acute diseases, general debility and deterioration of health. Above all, Jamaica is admirably suited for all suffering from over-work, worry and the attendant nervous troubles, the atmosphere and surroundings being of a distinctly soothing character for both mind and body.

I hope that the facts I have brought together will enable my readers to form a favourable judgment of Jamaica as a health resort. There are many points which, to do them justice, deserve a paper to themselves, but I have thought it best to give a sketch of the island as a whole, hoping that others may feel drawn to make a special study of the climate in those parts particularly suitable to invalids, and also of its effects on special classes of disease.

Our American cousins have long found a welcome refuge from their own rigorous winters in the even temperature of Jamaica, and it is somewhat ironical to find an American guide to our own colony on sale in London as the best available.*

I am confident that the mineral springs have a great future before them: they require development at competent hands, and I am sure that one of the best means of promoting their improvement is to bring them to the knowledge of this Society.

Reciprocity is the cry of the day, and when we have an asset of this character going to waste in one of our own colonies it is surely sound policy to realise it.

In bringing this paper to a close I have to acknowledge my indebtedness to my collaborator, and to the Librarian of the Royal Colonial Institute for allowing me to make use of Mr. Maxwell Hall's Meteorological Reports, the works of Drs. Phillippo, Logan Russell, and others bearing on the subject, as well as to Mr. Frank Cundall, of the Institute of Jamaica, for the latest information as to the Milk River and Bath Springs.

ANALYSIS OF THE MINERAL SPRINGS OF JAMAICA.

ST. THOMAS THE APOSTLE, BATH.

One pint contains—	Carbonate of Soda	·21
	Chloride of Sodium	1·48
	Chloride of Potassium	·04
	Sulphate of Soda	·79
	Sulphate of Lime	·62 (?)
Temperature,	Silicate of Soda...	·45
130° F.	Sulphuretted Hydrogen ...	Undetermined.

MILK RIVER SPRING.

One pint contains—	Chloride of Potassium	1·44
	Chloride of Magnesium ...	37·08
	Chloride of Sodium	186·93
Temperature,	Chloride of Calcium	13·50
92° F.	Sulphate of Soda	27·93

Traces of silica, chloride of lithium, iodide of sodium, bromide of potassium, bromide of sodium, bromide of magnesium and silica. Organic matter undetermined.

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* Stark's "History and Guide to Jamaica" (Boston, 6s.) is the one referred to. But I would call attention to the admirable little handbook published by the West India Committee, "Jamaica in 1901." (H. Sotheran & Co., Piccadilly.)

Section of Jamaica showing Blue Mountain, which drains trade winds of their moisture, and protected a large portion of the island in the recent Cyclone.

JAMAICA RAINFALL.

Means for Three Decennial Periods in the Four Divisions of the Islands.

Means for ...	N.E.	N.	W.C.	S.	The Island
	Inches	Inches	Inches	Inches	Inches
1870-79	91·04	57·34	70·73	50·53	67·41
1880-89	84·96	50·96	75·74	54·51	66·54
1890-99	98·60	57·36	92·17	56·45	76·15

Average Rainfall for the Months, 1902.

Means for ...	N.E.	N.	W.C.	S.	The Island
	Inches	Inches	Inches	Inches	Inches
January ...	5·40	3·34	2·37	1·70	3·20
February ...	4·1	2·28	2·71	1·80	2·92
March ...	3·30	2·04	3·49	2·11	2·73
April ...	5·33	3·21	7·66	3·89	5·02
May ...	12·76	7·56	14·13	8·85	10·82
June ...	8·09	4·41	7·77	4·70	6·24
July ...	6·32	3·10	7·92	4·40	5·43
August ...	7·26	4·43	9·52	5·19	6·60
September ...	8·34	5·33	10·53	6·35	7·64
October ...	13·87	7·99	14·13	12·42	12·10
November ...	10·97	5·85	6·06	4·78	6·91
December ...	9·91	5·72	3·78	2·66	5·52
Total means	95·56	55·26	90·09	58·65	75·13

BRITISH BALNEOLOGICAL AND CLIMATOLOGICAL SOCIETY.

ORDINARY Meeting held at 20, Hanover Square, London, W., on Wednesday, January 20, 1904. Dr. STREET, President, in the Chair.

Dr. HEDLEY read a paper entitled "Physical Therapeusis: a Rapid Review."

The PRESIDENT said he had been very much interested and he hoped all present had also been so, in Dr. Hedley's lecture. He wished to ask a few questions, and if Dr. Hedley realised how ignorant he (Dr. Street) was on the subject, he would pardon them if they appeared stupid questions. Firstly, could the lecturer tell the Fellows anything about the radio-activity of sea-water? The presence of radium and helium in certain waters had been ascertained. He was very much interested in Dr. Hedley's suggestion that their radio-activity might explain the greater usefulness of certain waters on the spot than when they were bottled and taken away from their source. There was not a great tendency to bottle and carry away sea-water, but it had been carried from Norfolk or Suffolk for use in London. Also, why should the ulceration caused by radium last the inordinate time of six months? There must be something very peculiar about such a lesion which could cause it to remain unhealed for so long. With regard to the measurement of radio-activity, the little box which had been handed round might represent a meter of radio-activity, but he did not follow how it was used. When Dr. Hedley mentioned the use of radium suppositories of a strength of 1 in 7,000, he felt, personally, that he would prefer that someone else should try them first. There was also the question of the thorium and pitchblende plaisters, which had been passed round for inspection; how was their activity measured, and how were they applied?

With regard to the aluminium meter in the measuring tube, he asked why the distance at which the meter was held from the tube did not seem to be material. Why did not the rule "inversely as the square of the distance" apply in that case? If it did, it might account for the different readings by the different observers. He was very glad to find that Dr. Hedley was not a "hyper-enthusiast" about the forces of which he had spoken, for he had been kind enough to tell the Society about the failures as well as the successes. The speaker had said enough to show that he was neither a phosphorescent nor a fluorescent body; otherwise he was sure Dr. Hedley's N-rays would have evoked more luminosity from him, but he hoped those who would follow would be more radio-active.

Dr. LEONARD WILLIAMS asked if Dr. Hedley would be good enough to tell the meeting something about the high frequency treatment. A great deal had been heard about it, and he thought one might say it had been freely "quacked" in the provinces. Could Dr. Hedley, as a scientific authority, tell the members that the high frequency treatment in his hands ever had any other than a purely subjective effect? There could be no doubt that high frequency had effects, but whether those effects were other than subjective he had very strong reasons to doubt. He would be glad if an immediate reply could be given, as he was obliged to leave the meeting almost at once.

Dr. HEDLEY, in reply to Dr. Leonard Williams said he regretted that test cases were almost absolutely wanting as to the effects of high frequency treatment, and he could not himself supply such. He could only speak of the general impressions of his own work. All knew that certain demonstrable physiological effects ensued after its use; there was an alteration of the output of carbonic acid, and the urea was relatively increased. There were also effects on the blood, and on the blood pressure. His impression was that high frequency treatment had been of use in several obstinate conditions, of which rheumatoid arthritis was one, particularly

those with contractures, dyspepsia, and articular troubles. Under such circumstances he used a combination of remedies —sinusoidal currents, heat, high frequency currents, manipulations, massage, &c.; therefore it was very difficult to attribute to anyone of those its fair share of the result. Experiments could not be made, because one was anxious to cure the patient. Since the systematic use of high frequency currents in the treatment of rheumatoid arthritis, which he regarded as a disease of nutrition, he had had better results. He had never got any accurate results in the treatment of tubercle by rays or electricity, but he had proposed elsewhere that a Committee should be formed to investigate it, in connection with the medical staff of some special hospital. He regarded that as the only proper way of going to work in the matter.

Dr. LEONARD WILLIAMS said he felt inclined to take advantage of the presence of Dr. Hedley and put him into the witness-box. He had heard from an authority whom he was inclined to trust, that high frequency currents had been used with considerable success in the treatment of hæmorrhoids, and he desired to hear the result of Dr. Hedley's experience on that point. A member of the profession, whose respectability was above suspicion, had said that high frequency currents in his hands practically caused the disappearance of hæmorrhoids, but he (the speaker) found it rather difficult of belief.

Dr. HEDLEY, in further reply, said he would certainly endorse that experience as to hæmorrhoids, both internal and external. Also, in fissure and painful conditions of the sphincter high frequency currents had certainly been effective.

Dr. SANSOM said he was very sceptical as to the value of high frequency currents. A friend of his at Nice subjected himself to them at one of the installations, and he went with that gentleman and saw him treated. His friend asked him to submit the question to one of the authorities of the day. He did so, but that authority was now deceased. The verdict was—" Well, I do not know much about these currents,

but I do not think much of them ; there is *nothing positive* about them." That was exactly the attitude of Dr. Hedley also, whom he thanked most heartily for his paper. Though he could boast of Dr. Hedley as a colleague, that gentleman would know he was also a critic. He could not help thinking that the treatment of hæmorrhoids by high frequency current could be very subjective, and there must be something hypnotic in it. In order to get hæmorrhoids there must first be some liver trouble, *i.e.*, some trouble of which the liver was the general disponent. The question thus arose whether there could be an influence upon nutrition and upon digestion generally through the subjective phenomena of the body. He thought there could. Dr. Hedley had very aptly referred to the question of rheumatoid arthritis, in regard to which he (Dr. Sansom) was a very pig-headed person. He thought that disease was the outcome of many things, and had said in writings that it probably had its origin in the nervous system, possibly in the spinal cord, and thus the treatment of it must be anything which made the patient feel better generally, as against the treatment for true rheumatism, which was so successful by means of the salicylates and salicin. He also emphasised the value of climatology and the therapeutics based thereon. He had derived a large amount of instruction from the paper and demonstration. and he hoped the exponents of that very difficult question would be as judicious and judicial as Dr. Hedley had been.

Dr. Braithwaite asked, in reference to rheumatoid arthritis, whether Dr. Hedley considered the effect of high frequency currents was due to a tonic effect on the whole system, or to some effect on the cause of the condition whatever that cause might be.

Dr. Symes Thompson, referring to the apparatus used for measuring the effect of the rays employed in therapeutics, supported the opinion of the President that the power of the rays varied "inversely as the square of the distance." It would be a matter of considerable value if it could be shown that we have the means of testing and exactly ascertaining

the strength and potency of the light brought to bear upon diseased textures. Perhaps one of the most important points in the demonstration had been the suggestion that we have the means, not at present perhaps very accurately defined, of measuring the quality and quantity of the rays used in treatment. We are all very grateful to Dr. Hedley for providing us with the means of knowing exactly what we are doing when we employ these rays.

Dr. GROVES said that quite sufficient evidence had been forthcoming that the methods demonstrated that evening were a rather dangerous form of therapeutics. Probably before very long the profession would be up in arms about it, and it behoved those who studied it and made a specialty of it, to find out what electricity would do, so as to protect themselves, or certainly the result which the last speaker foretold would come about. He knew of men who were treating everything by high frequency and X-rays, men who were so successful in remote country districts that they were taking partners. He had no means of watching the treatment or forming an opinion as to its efficacy, but the best men who were using it seemed to be none too well informed about it, except the lecturer and Dr. Herschell. Even Dr. Hedley did not speak very positively about it. He (Dr. Groves) had heard of many forms of treatment for hæmorrhoids and fistula, by means of which men had made a great deal of money, but they were not used now. The experiments on the subject of physical treatment, as in the case of other scientific work, should be conducted in some public institution by scientific men.

Dr. GAGE BROWN said, in reference to X-ray skiagrams, that he went in for photography, and it seemed that for X-rays one never had to focus the plate, and yet near and distant objects seemed equally clear.

Dr. GEORGE HERSCHELL said he was very much surprised to hear anyone suggest, in the present state of knowledge, that the effects of the high frequency treatment could be due to any large extent to suggestion. He would be pleased

if Dr. Sansom would come to his consulting rooms, for in five minutes he could prove that there was very little suggestion about the matter. When one spoke of improvements being effected by the high frequency current one must guard against fallacies. People said they had tried "electricity," but they might as well say they had tried medicine, or that they had tried surgery. The sailor who had his arm broken before the mast and had it set by a comrade on the spot with a bad result, might as well say he had tried surgery. When one found nurses and others administering high frequency currents whose only training had been a short course in a massage school, he thought the results which were talked about must be accepted with reservation. There were certainly three different methods of using high frequency currents, and there were three distinct classes of results, First, the influence on the metabolism obtained by auto-condensation and auto-conduction, and that, as Dr. Hedley said, was not directly demonstrable, for although it was known that one could increase the excretion of urea and carbonic acid gas, one did not know whether in a diseased person much improvement could be effected. But there were other results which could not be denied. For instance, if one took the currents from the two ends of the selenoid and put a spark gap in the circuit, there would be produced muscular contractions which were not due to imagination. Those contractions were as great as those obtained with the Faradic current, or with the Morton current. He had found it useful in the treatment of myasthenia of the stomach wall with motor insufficiency. The current from the small selenoid, interrupted by the spark gap, would cure mild cases, and convert severe cases into mild ones; *i.e.*, where there was retention of food, shown by a residue in the stomach before breakfast, those cases would be converted into those where there was no residue, but only a certain delay in emptying the stomach. If one took a vacuum tube electrode and connected it with the end of the resonator, a spark would be produced which certainly had an effect upon piles; it was not imaginary. The blue

inflamed pile when bombarded with small sparks could be seen to shrink with every application. After four or five such applications the pile in many cases disappeared. Then in regard to fistula, a case of stomach disease was sent to him a few months ago by a doctor at Surbiton, and, incidentally, the man had a small fistula, through which a probe could be passed into the rectum. As he was having high frequency treatment for his stomach he suggested that the patient should allow an electrode to be placed in his rectum to see if any good would be done to the fistula. This was agreed to, and a metallic rod was put into the rectum and high frequency currents from the resonator passed into the rectum every day, for a dozen applications. At the end of that time the fistula had healed, to the surprise of Dr. Holberton, who sent up the case. The most serious thing, he thought, about high frequency and other forms of physical therapeutics was, that they could not take the position to which they were entitled in the treatment of disease because they were allowed to be used by unqualified persons. Those who had heard Dr. Hedley's admirable lecture must have concluded that those currents could be of use only to the man who knew what they could do, and who used them as instruments of precision. By such men they could be used as part of their ordinary armamentarium. If, however, they were delegated to the hands of "medical electricians" they certainly would not do good except by accident, and possibly might produce much harm, and the procedure would thereby come into unmerited contempt, and people would say that high frequency treatment had been found wanting. As an instance of the unfair attitude adopted by some members of the profession towards those matters, he was lately reading, in a medical journal, a review of a book in which electricity had been advocated for the treatment of some diseases of digestion. The reviewer proceeded to say that the efficacy of electricity in diseases of digestion was yet in a very unsettled condition, and that in England, at any rate, it had not made any headway. The reason it had not made headway was that prac-

tically no one had tried it, making use of modern methods. How many of those in the room knew personally of any doctor who had put an electrode into the stomach, as recommended by Einhorn of New York? He had done so many times himself, and he would not like to be without that method of treatment. For the treatment of gastric neurasthenia there was nothing he knew which would produce the same effect as the current from a high tension Faradic coil applied to the interior of the stomach with a suitable electrode. But in London one could count on the fingers the number of men who had tried it. How then could one say authoritatively in one of the biggest journals of the profession, that it had been tried and found wanting? It had not been tried, and accordingly it had not made headway. The treatment should be kept in the hands of the profession, and not delegated to nurses and electricians.

Dr. SUNDERLAND said he wished to express his own personal thanks to Dr. Hedley for his very valuable paper. He thought all should be extremely grateful to that gentleman because a week or two ago he (Dr. Sunderland) found the Society was without a paper for that evening, several Fellows having failed to supply their promised communications. He was in despair, but approached Dr. Hedley; he did not feel bold enough to call upon him and therefore telephoned. The result was very satisfactory, for Dr. Hedley, at such short notice, and at great inconvenience, had put together his excellent paper. The only question he desired to ask was "Had the Finsen Light or the X-rays or radium any effect on cheloid in scar-tissue of wounds?"

Dr. HEDLEY, in reply, thanked all the speakers for the kind way in which they had received the paper. Seeing how much the discussion had centred round high frequency, he was sorry he did not deal with that first and at greater length. High frequency would suffice of itself to fill an evening, and he knew there were many in the room who had an exclusive personal experience of it. He knew nothing definite about the radio-activity of sea-water, and was not

acquainted with the experiments. The ulceration produced by radio-active substances was of the same kind as that caused by X-rays. The pathology of it was still an open question and could not be entered into at that late hour. The first idea was that it was a neuritis; afterwards the microscopic changes were found to point to degenerative changes affecting both the nuclei and protoplasm of cells, especially epithelial cells, and later on an obliterative arteritis. Certainly if X-rays were injudiciously applied there was an obstinate and intractable form of ulceration which must still be considered. Whatever applied to X-rays applied also to radio-activity in that way. With regard to measurement—in the apparatus he had shown it was a matter of comparing colours in one apparatus and depth of shadow in the other, therefore distance did not seem to enter into the question. With regard to thorium and pitchblende, it was a matter of relative radio-activity in the substances. The purest radium obtainable was a million times more radio-active than uranium, and the uranium more so than pitchblende. The use of those substances was purely a matter of cautious experimentation. In the case of pitchblende one could safely leave the plaster on for many weeks. In some respects it would be a great advantage (at least to the patient) to be able to do that, and thus obviate the necessity of coming to town three or four days a week. Those plasters had been used by only one or two practitioners, and he supposed that gradually more definite information would be forthcoming. With regard to the hypnotic effect suggested by Dr. Sansom, he (Dr. Hedley) believed that every method of treatment had a psychical as well as a physical side, and he thought the former was often underrated. If a patient be told that he is taking a nervine tonic there is at once the "suggestion" that his nervous system is being "toned up." If he is aware that his prescription contains "iron" or "steel," these, associated as they are in his mind with strength and endurance, the element of suggestion again comes in. He was sure that in electrical treatment there was a good deal

of that element. As to whether high frequency currents cured locally, or by general effects, he could only say that when he had treated one or two patches of psoriasis in that way, other patches on other parts of the body had disappeared also; and he thought the general effect on the nutrition played a very important part in the treatment. As a working hypothesis he still preferred to regard rheumatoid arthritis as a trophoneurosis, and the electrical treatment, he believed, acted by its influence on metabolism. He could not answer Dr. Sunderland's question as to keloid from his own experience, but he thought that he had seen reports of cases which had been favourably influenced by X-rays. With regard to the question of focussing X-rays, by lenses, this, of course, was impossible, as they were not subject to the laws of ordinary light. There was often, of course, a great difference in the definition of an object when X-rayed; some pictures were very indefinite in outline; others most definite. He generally attributed that to the secondary rays having their origin in the tube, as well as in the tissues. X-rays falling on tissue produced secondary rays, and it was these rays as well as the secondary rays generated in the tube itself, which was the cause of want of definition found in deep abdominal radiographic work. With reference to the remarks of Dr. Herschell, he could fully corroborate the results of electrical treatment (especially of Dr. Herschell's treatment) in diseases of the stomach or intestines. In future he thought he would not be so rash as to attempt to deal with so many things in one evening.

A hearty vote of thanks to Dr. Hedley was then put from the Chair, and carried by acclamation.

BRITISH BALNEOLOGICAL AND CLIMATOLOGICAL SOCIETY.

Copy of Minutes.

Ordinary Meeting held at 20, Hanover Square, W., on Wednesday, January 20, 1904, at 8.30 p.m. The President, Dr. Street (Westgate-on-Sea), in the Chair.

The minutes of the last meeting were read and confirmed.

The following candidate was elected a Fellow of the Society :—

Francis Jaffrey, F.R.C.S., L.R.C.P., Assistant Surgeon St. George's Hospital, 33, Nottingham Place, W.

Dr. Hedley (London) read a paper on "Physical Therapeusis : a Rapid Review."

The following took part in the discussion : The President, Dr. Symes Thompson, Dr. Leonard Williams, Dr. Sansom, Dr. Herschell, Dr. Braithwaite, Dr. Gage Brown and Dr. Sunderland.

A special vote of thanks was passed to Dr. Hedley for his kindness in having prepared this paper at very short notice.

SIR EDWARD HENRY SIEVEKING,

M.D.Edin., F.R.C.P.Lond.

First Honorary President of the British Balneological and Climatological Society.

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VOL. VII. JULY

BRITISH BALNEOLOGICAL AN... SOCIETY

WEDNESDAY, M...

SOME ASPECTS OF OB...

BY LEONARD WILLIAMS, M...

Assistant Physician to the ...

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BRITISH BALNEOLOGICAL AND CLIMATOLOGICAL SOCIETY.

WEDNESDAY, MARCH 3.

SOME ASPECTS OF OBESITY.

BY LEONARD WILLIAMS, M.D., M.R.C.P.
Assistant Physician to the German Hospital.

LIKE many conditions which used formerly to be considered separate clinical entities, obesity is now regarded as merely a symptom of several, if not of many, underlying pathological states. It is not only not a disease *per se*, but occasionally it is not even, strictly speaking, pathological, inasmuch as its presence is apparently essential to the ordinary physiological working of certain individuals.

In its commoner forms obesity is due to a want of balance between intake and output; either too much food is ingested or too little is oxidised. In many cases both these forces are at work in a superlative degree; the intake, both as to quality and quantity, being inordinately great, and the output outrageously small. These cases are those which tend to excite the mirth of the ribald and the ingenuity of the caricaturist. They are represented typically by the broad man with florid complexion, short neck and aldermanic abdomen, upon whose case the popular prognosis is that he will surely die of

apoplexy. As a matter of fact, he very seldom does, but that is another story.

Of course, all cases, even of ordinary obesity, do not lend themselves so readily to diagnosis and treatment as the above imaginary patient. The exact nature of the want of balance between output and intake is often very difficult to discover. It will, nevertheless, generally be found if we are careful to enquire (*a*) into the ingested materials, their quantity and quality, and (*b*) into the facilities which the mode of life affords to the normal oxidising processes of exercising unimpeded their beneficent functions.

First, then, with regard to the ingested material. It may be excessive in quantity ; and in the case of those who have been athletic in youth this is by no means infrequent. Out-door games and exercises during the growing period beget a habit of taking large and substantial meals ; the out-door exercises are perforce given up when the serious business of life is commenced, but the habit of large meals remains. It is, as a rule, nothing more than a habit, but the remedy, if sufficiently obvious, is not always easy of attainment.

Another set of persons who habitually take more food than they can assimilate without injury are those deluded creatures (generally women) who imagine they want "supporting," as they term it. The typical patient of this class is the lady to whom the menopause has proved rather trying. She is very sorry indeed for herself, and feels so weak that she finds it necessary to be "kept up" by bin-hourly doses of something nourishing. Milk and beef-tea vie with tinned jellies and peptonised foods for the honour of conferring this nourishment, which on enquiry will generally be found itself to require supporting with a little alcohol. These cases are very difficult, indeed, they are almost impossible to treat successfully at home. The meagre effects of infinite tact and patience laboriously exercised while the victim is still amongst her ordinary surroundings, are as nothing compared to the results which may be confidently expected by sending such a case to a health resort, preferably in a bracing climate, where the ritual of baths, massage and drinking waters is substituted for

the relaxing ministrations of the parrot, the parson and the sympathetic spinster friend. It is the more necessary to remove such patients from these and similar influences because, in addition to taking too much food, they invariably commit those other obesity-inducing hygienic crimes to which I shall presently refer.

Another common cause of the ingestion of too much food is the practice of drinking fluid with meals. The fluid, even if it be not alcoholic, which it too frequently is, not only seems to increase the appetite, but, by enabling the food to pass more rapidly out of the stomach than it would otherwise do, it makes it possible for the patient to eat more. One can often reduce the proportions of a fat person very considerably by insisting that no fluid be taken during meals. The amount of fluid necessary for the healthy working of the body is best taken from half to a quarter of an hour before food, or, if this is inconvenient, it may be taken when all the solids have been eaten.

The importance of the due mastication of food is very generally recognised, but the recognition is, I fear, a rather academic recognition; and some of us are even quite pleased if we remember to refer to the matter when giving directions to a patient who suffers from indigestion. But though we may not enjoin its practice as often as we should, there is not one of us who does not endorse its general desirability in all gastric disturbances. In connection with obesity, however, the importance of due mastication is scarcely accorded even a theoretical recognition. I am, nevertheless, convinced that disregard of this important and consequent insufficiency of mastication is a very common cause of the ingestion of too much food. The term insufficient is, of course, dangerously elastic, and it is therefore necessary to be more precise. It was said of the late Mr. Gladstone that he masticated each mouthful thirty-two times (once for each tooth), and that he attributed his great mental and bodily vigour largely to this practice. It now appears that this number of thirty-six is altogether inadequate. In a paper read before the British Medical Association in July, 1901, entitled "Was

Luigi Cornaro Right?" Mr. Van Someren states that every mouthful should be masticated until it is both fluid and tasteless. This may seem rather startling, but anyone who does this conscientiously during one meal may readily prove for himself that the amount of food which it is possible to take at that meal is immediately reduced by at least one-half. There are a great many points of the highest interest and importance in connection with this matter, but I must content myself here with expressing the belief that insufficient mastication leads to the ingestion of a great deal of altogether unnecessary food, and is thus indirectly responsible not only for some cases of obesity, but also for other troubles which are outside the scope of this paper.

But excess, as we know, may also be a matter of quality. The actual amount of food taken may be moderate enough, the excess revealing itself in the relative quantities of fat-forming or fat-saving principles. All the "systems" for dietetic treatment of obesity with which the text-books deal so exhaustively* are drawn up in the recognition of this central fact. Whether the fats are chiefly attacked, as in Oertel's system, or whether the carbohydrates, as in Ebstein's, or both fats and carbohydrates, as in Banting's and Salisbury's, the main principles are the same, namely, a severe restriction of those proximate principles which are most readily converted into adipose tissue. These are, of course, the starches, sugars, fats and alcohol, leaving the diet to consist mainly of proteids of animal origin, which are themselves in most of the systems reduced much below what is normally necessary to meet the daily output. In connection with these systems, whose efficacy is beyond dispute, it is therefore necessary to remember two things. The first is that if the published quantities in any one of them are adhered to, the patient is not only being starved of fats and carbohydrates, but he is also being severely limited in the whole amount of food taken. The discipline is thus apt to be a very trying one, and may

* "Food in Health and Disease," by Dr. Burney Yeo (Cassell and Co.); "Food and the Principles of Dietetics," by Dr. Robert Hutchison (Edward Arnold).

even in some cases give rise to serious weakness. The other is that such food as is permitted, being nitrogenous and drawn almost entirely from the animal kingdom, the treatment is by no means free from the danger of causing grave trouble in the excretory organs, notably the kidneys and the skin. I have known more than one case in which a granular nephritis was determined, even if it was not actually caused, by a too rigorous application of the principles underlying these methods. In the matter of the skin the experiments of Dr. Chalmers Watson† with flesh-fed fowls should warn us that interference with its nutrition during the treatment should be received as an indication that the "system" is not well tolerated.

Let us now consider for a moment the other causative factor in the production of ordinary obesity, namely, inadequate oxidation of the food which is taken. The chief agent in effecting oxidation is admittedly muscular exercise, and where circumstances allow this agent full play, what is called ordinary obesity may be said never to occur. The one part of the body in which fat tends to accumulate, despite a very fair average of muscular exertion, is the abdomen, and this fact should serve to remind us of what we are too apt to forget, namely, that the effect of muscular contraction in oxidising superfluous adipose tissue is not only general but local.

The deposit takes place in the abdominal wall and intra-abdominally, giving rise to what is called an aldermanic figure, mainly because in the majority of people the abdominal muscles are very little exercised. In people whose work necessitates the vigorous use of their muscles, boatmen, for example, the aldermanic figure is an exception. Outside such employments it is very rare, indeed, to examine any one who has well-developed and well-exercised abdominal muscles, and we consequently find this region to be one in which fat deposits itself, so to speak, without fear of disturbance. In the treatment of obesity every one rightly attaches the utmost

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† *Journal of Balneology*, April, 1904; and *British Medical Journal*, January 9, 1904.

importance to exercise, but I venture to say that not enough stress is laid upon the special necessity for securing adequate development of those muscles which cover the abdominal viscera. We have heard enough—more than enough, probably—of the multitudinous miseries which lurk in the "abdominal pool" or the "splanchnic lake," but there can, I think, be no doubt that conditions which favour undue abdominal venosity are precisely those which conduce to the development of obesity, and undue abdominal venosity is more often caused by relaxed, atrophic, abdominal muscles than by anything else.

It is well to remember that there exist substitutes for ordinary exercise which, when once obesity is established, have many and powerful claims upon our attention. I refer to such means as massage, electricity, Swedish movements and Zander exercises, means which people can seldom be induced to employ while following their ordinary occupations, but to which they will submit with the utmost readiness when away from their every-day surroundings. In the matters both of diet and exercise the health-resort treatment of the condition, provided always that the health resort is properly selected, holds advantages which cannot be obtained at home.

The part played by the nervous system in oxidising food must be apparent to any one who has witnessed the extreme degree of emaciation to which mental anxiety may give rise. Some portion of the effect in such cases may be due to the loss of appetite which almost invariably accompanies the anxiety; that it is not wholly due to such a cause, however, is obvious from the fact, familiar to all, that brain-work in the study is even more provocative of hunger than exercise in the open air. The obvious deduction from these considerations is that the patient suffering from obesity should be made actively to employ his mind—a counsel of perfection which is the more difficult of attainment on account of the mental lethargy which the condition itself begets. It is, nevertheless, possible to do something in this direction, by taking such a person out of the groove in which he will invariably be found to gyrate, and placing him under conditions where his senses

are constantly being roused by things unfamiliar to him and where mental and physical energy is forced upon him.

Here, again, the health-resort treatment offers very conspicuous advantages. At a foreign station, where the language, the customs and surroundings are all strange, the mind is stimulated to fresh and unaccustomed energies and the interests are lured beyond the narrow confines of their ordinary channels.

But insufficient oxidation is the result of other and less generally recognised causes than those which we have just considered, causes whose operation gives rise not only to obesity but to other conditions which are usually ascribed to the artificial lives which town-dwellers are forced to lead. Chief among these is the attitude which the majority of people adopt to that most important organ, the skin. Having regard to the size of this organ and the various functions which it is called upon to perform, it is truly astonishing to observe the insignificant part assigned to it by all existing schemes of personal hygiene. Its influence upon general metabolism is so little considered that the very factor in its usefulness in this direction, namely, its power of contracting to cold, is precisely the one which existing customs seek, above all things to nullify. It seems to be forgotten in the case of the skin what is regarded as axiomatic in the case of all other organs, namely, that disuse gives rise to abeyance or loss of function, and instead of the contractile power being educated and cultivated by rational exposure, we see it rendered sluggish and inert by daily hot baths and habitual over-clothing. I should be the last to say anything to disparage the value of hot baths when scientifically used with a definite end in view, but their daily use for ablutionary purposes by the young and healthy, in that they save oxidation and diminish metabolism, is most undesirable except when, as so seldom occurs, they are immediately followed by cold effusion and vigorous towelling.

The prevalent vice of over-clothing is more important because it is so much more general, extending as it does down to almost the lowest grade of hospital patient, and because its consequences to the individual reach much further. For

these consequences are seen not only in the obesity and its concomitants to which they contribute in adults, but they are writ large upon the anæmic faces, the ill-developed limbs and contracted chests of the delicate, coddled, children, especially of the upper classes. The ridiculous heresy which has given rise to this state of matters is the ignorant fear of what is designated "a chill," a heresy which I fear has been largely fostered by the attachment of the profession to traditional shibboleths. The normal skin of a healthy person is endowed with the power of reacting to cold influences with conspicuous and demonstrable benefit to the organism, and the surest way of depriving it of the power is to protect it from the influences. Among the many evidences of the responsibility of the profession in this direction is the almost universal recommendation (because, forsooth, it protects from "chill,") of woollen underclothing, a material which, as being ill-ventilated and unabsorbent, is of all others the best calculated to induce a relaxed and unresponsive condition of the skin. It would seem necessary to remind the flannel enthusiasts that all warmth comes from the internal oxidising processes, and that it is not in any degree derived from the material worn. Woollen materials are extolled on account of their air spaces, air being a non-conductor of heat, and if this constituted their main difference from other materials there might be some ground for the enthusiasm. But it does not. Dry flannel is practically unabsorbent, whereas linen, cotton and silk are, in different degrees, very absorbent. It is possible to imprison air in these materials, but it is quite impossible to render flannel absorbent except by making it damp; and the above-mentioned enthusiasts would as soon wear a live rattle snake round their necks as don a garment that was not thoroughly "aired." The result, then, of the practice of wearing flannel undergarments is to imprison a layer of moist and impure air in immediate contact with the skin: the wearer is, in fact, condemned, so far as his cuticle is concerned, to live in a moist climate. Now all climatologists are aware that not only are moist climates relaxing in their effects, but that in such climates both heat and cold are most severely felt.

There is no heat so oppressive as that of a "muggy" day, nor cold so penetrating as that of a foggy day. It follows, therefore, that the consequences of wearing these under-garments is general lowering of the metabolic processes, oppression in summer, and so sensitive an appreciation of cold in winter, that the number of outer garments worn is grotesquely out of proportion to rational and physiological needs.

Closely associated with this fear of chill in the production of inadequate oxidation is the even more genial and infinitely more pernicious fear of draughts. This is another heresy from the responsibility for which I fear the profession is not altogether free. To the uninitiated it is difficult to understand what exactly is meant by a "chill." The term is in great request as a cloak for loose diagnosis, but earnest investigation on my part has hitherto failed to elicit anything which could be described as a definition. A draught one understands, it is the *courant d'air* of the French, but inasmuch as the gravamen of the charge against it consists in the assertion that it causes a "chill," the position must remain obscure until a definition of the latter is forthcoming. The popular impression seems to be that chills give rise to nasal, laryngeal and bronchial catarrhs, and that such chills are more often due to draughts than to anything else. Draughts are therefore guarded against in every possible way. The body is over-clothed, rooms are over-heated, and fresh air is excluded as rigidly as if it were the plague. Catarrhs, nevertheless, occur with energy and regularity; the victims declaring that they must have caught a chill, though they cannot imagine how. Public opinion demands that draughts shall be excluded from theatres, concert-rooms, public dining-rooms, and the like, with the result that nearly all these places are intolerably stuffy and outrageously unwholesome. Members of the profession, commonly, direct that draughts are to be excluded from the sick-room, and so zealously are their orders attended to, that the poor *vis medicatrix naturæ* from which we now-a-days demand so much is expected to make bricks without straw in combating microbes without oxygen. The natural result of this heretical doctrine and its too willing adoption is

that catarrhs and rheums flourish in our midst like a green bay-tree. For these things are, all of them, or very nearly all of them, microbic in origin, and the policy of the exclusion of draughts affords to the micro-organisms exactly the medium which is most favourable to their growth and development. The person who, despite the fact that he returned home in a closed vehicle, muffled up to his eyes in furs, "must have caught a chill coming out of the theatre" does not realise that for three hours he had been inhaling the microbic excreta of other people's air passages, and that the very "draughts" which he had so piously excluded on his way home, if they had been allowed free play, would probably have killed some of the germs and so proved his salvation.

I have often put it to people, sometimes in railway carriages, that it is a disgusting thing to breathe air which has passed through the lungs of others. The senses recoil at the bare suggestion of utilising, in any dilution, material which has passed through any other internal organ. Nevertheless, the lungs being excretory organs, the analogy, however unpleasant, wants nothing in completeness. The open-air treatment of phthisis has done something towards the purging of this monstrous and destructive heresy; but the leaven works slowly, and the man in the street insists upon regarding the open-air system rather as a trying discipline properly reserved for the tuberculous, rather than as a measure of general hygiene, prophylactic as well as curative.

The bearing of these considerations upon obesity and other states of sub-oxidation or deficient metabolism is sufficiently obvious. To the proper elaboration of any metabolic process oxygen is essential, and it is evident that no such process can work smoothly and efficiently if the stream of necessary oxygen is attenuated and polluted at its source. If the ignorant fear of draughts, with all its disabling consequences, is to be stamped out, the gospel of the absolute necessity for abundance of fresh air must be preached vigorously and with determination, not to the tuberculous only, but also to those who, like the gouty and the obese, are the victims of perverted or insufficient metabolism.

But unhampered and augmented oxidation, even when combined with suitable dietetic regulation, is effectual only when supplemented by efficient excretion. The products of combustion, if not promptly removed, become a potent source of evil. And here, again, we are reminded of the necessity for paying due attention to the activities of the skin and lungs as well as to those of the bowels and kidneys. The excretory function of the skin is one which is even more important, as it is certainly less considered, than its heat-regulating function, and it is seldom, indeed, that, except at health resorts, any serious attention is paid to it. The lungs, as I have endeavoured to show, are not encouraged by prevailing customs to render any assistance in this matter, but it may be confidently asserted that practitioners at health resorts are more alive than their brethren in large towns to the beneficent effects of the open air and sunshine in all morbid states.

Patients sometimes think that the mere drinking of some natural mineral water will cure them of obesity, and the mistake may be excused when we recall the great reputation which is enjoyed by Carlsbad, Marienbad, Homburg, Kissingen, Brides-les-bains, and others, in the treatment of the condition. In so far as the waters themselves at these places are helpful, they are so in virtue of their effects upon the bowels and kidneys when taken internally, and of their action on the skin when administered in baths. They have no specific action upon adipose tissue, and the resorts owe their just claim to recognition largely to the attention paid by the physicians to other details, and mainly to the readiness with which patients will attend to their instructions.

Another method of treating obesity which is much in vogue at present is that by thyroid extract. Unfortunately, the lazy and well-to-do among the public are well acquainted with its powers in this direction, and as it can be obtained across the counter, the *rôle* of the physician in connection with it is generally that of detecting the fact of its surreptitious use. Like some of the drastic dietetic systems, it is certainly efficacious in most instances, but it has this further resemblance to

them, that its use is by no means unattended with danger. The restlessness and tachycardia to which it is liable to give rise often persist for long periods after the drug is withheld. It constitutes a means of augmenting metabolism, but unless its exhibition is carefully supervised and associated with the other details of management and hygiene to which I have referred, though it may reduce the obesity, it will probably give rise to other difficulties in comparison with which obesity might well be regarded as an ornament.

It was my intention to refer to some other aspects of this question, such as hereditary obesity, and the condition which Jonathan Hutchinson has described under the name of lipomatosis universalis asexualis, but the consideration of these and other interesting matters must be deferred to a future communication.

Discussion.

There was much in the paper eminently suited for discussion.

Dr. Mahomed (Bournemouth) thought it was well critically to examine axioms from time to time to see that they remained true. In the last part of the paper the author referred to wearing flannel contiguous to the skin, a traditional practice which has been impressed on people for many generations. Some man pointed out one side of such questions, and the practice is adopted with so much vigour and passed on, that it might be perpetrated even a long time after it had ceased to be wise. With regard to mastication, he did not think he could give his complete adherence to Dr. Williams's remarks, otherwise some of his patients would accuse him of blowing hot and cold, as he had certainly told some of them they were getting thin because they bolted their food. But Dr. Williams came forward and practically said they got fat because they bolted it. He presumed that when one ate a large quantity and chewed it insufficiently, one only extracted first of all the stimulating properties, such as some would say were poisonous qualities, and then later on it was driven through the pylorus. After that he did not suppose much further digestion of it

occurred, and probably the larger part was extruded. But probably Dr. Williams would say the digestion of fats did take place in the intestines, and a much larger quantity of it was absorbed after leaving the stomach than was ordinarily supposed. He thought obesity often masked dropsy. It was not so easy as it would seem to distinguish between fat and dropsy in people who were very stout. Not long ago he had a female patient who was very stout, and for a long time he did not recognise that she was also a little dropsical; and when the circulatory condition improved she got much less stout. Probably when dropsy was present the serum lingered in the lymph spaces and the patient took up a good deal more in that way; possibly this was only partially oxidised and laid up as fat. Of course, exercise was the appropriate treatment. He had another very stout lady as a patient, and she could not do more than waddle across the lawn; it was the only exercise of which she was capable. He treated her with dietetic restrictions and the administration of thyroid extract, and he rigged up for her a little gymnastic cabinet, by means of which she could exercise her arms and legs while sitting. She had dropped many pounds in weight, and now she could walk about comfortably and get on and off tramcars. In both the cases referred to he believed the thyroid had been very useful in reducing the avoirdupois. However, in one of them there were heart symptoms, and he warned the patient not to push it. With regard to mental effort being somewhat antagonistic to obesity, it was pointed out in a recent discussion at one of the societies, on the subject of longevity, that men who suddenly retired from active business or from the Services began to degenerate, and sometimes quickly, from lack of their accustomed mental occupation; but that if they could be stimulated again definitely to use their brains, they appeared to take a new lease of life. He believed he had seen that happen in regard to people who came to health resorts with the intention of settling there. They soon got stout, but if they took up a hobby improvement followed. Dr. Williams had said that a hot bath prevented or hindered metabolism. He, Dr. Mahomed, could not contradict the statement, but would ask whether the author

was quite sure of it. He would have thought the effect would be to improve it. But when all had been said there would always be lean kine and fat kine. He was one of the former. He had always been a fairly hearty eater, and he took plenty of exercise. The quantity he ate seemed to make no difference to his bulk. Probably that peculiarity, like longevity, was born with the individual.

Dr. PERCY LEWIS (Folkestone) said one often heard Mr. Gladstone's habit of chewing thoroughly quoted, but one ought to remember that that gentleman died of cancer of the jaw. It seemed as if the contentions of Dr. Chalmers Watson at a recent meeting of the Society were going to colour all the discussions, namely, the question of putrefaction of food in the alimentary canal. He thought the first step in the treatment of obesity was to try to restore the aseptic condition of the alimentary canal. Very fat people would be found to have very foul-smelling motions, and he commenced by giving them calomel and other things to combat that. Dr. Williams's remarks about the skin were very interesting, and the more one thought of that the more light seemed to be shed on obesity. But he was not prepared to endorse all that the author said about over-clothing, nor about draughts and colds; the assertion seemed to be too sweeping; at any rate, it upset preconceived notions on the subject. People who were always walking about with respirators on and muffled up would sometimes go in for fresh-air cures on their own account, and then they would go back wondering how it was they were ever afraid of draughts. But there were others who had to give it up because they were continually having such bad colds. He had always wondered why the treatment should suit some people and not others. He believed it was a question of excretion. If the excretory organs held on the patients could stand the unaccustomed cold, but if the cold inhibited the action of the skin, and the deficiency were not made good by increased exercise, the patient would catch cold. Of course, theory and practice did not always go together. Colds were caught by sitting in draughts, microbes or no microbes; it was the experience of generations, and he was

not inclined to give up the idea at the dictation of Dr. Leonard Williams, who attributed the mischief to the microbes inhaled at the theatre. But there was another side to the question. If one sat for three hours inhaling microbes one also sat with a lowered vitality and a cold skin, and was not in a position to withstand with impunity such a sudden abstraction of heat from the body as occurred when going home. If people would walk home the harm would be greatly diminished; but if driving, the wraps would prevent a chill. Flannel next the skin was another custom which had been handed down, and though he did not believe that everything handed down was necessarily right, the teaching of experience counted for much. He found it impossible in his own case to wear flannel next the skin, but he wore thick cotton garments, and took a fair amount of exercise. Most of one's patients were females and they wore much less clothing in the way of protection than men, especially over the upper part of the chest, and they had nothing corresponding to the waistcoat. Again, their lower garments were loose, and one knew how cold it was to walk about in a dressing gown. He would substitute the words rational clothing for over-clothing. With regard to the sick-room and draughts, a person who was ill had a lowered vitality, and it was essential to protect him from draughts; but that did not necessarily mean to exclude oxygen. The House of Commons was ventilated without draughts, and there the oxygen was sufficient. If he (Dr. Lewis) were ill with pneumonia he would rather have a deficiency of oxygen than a plethora of draught. With regard to fat and putrefaction, dead bodies kept in water underwent a fatty change, and that might have some bearing on the subject. In respect of taking fluid with meals, again, he would appeal to the experience of custom. For generations people had taken drink with their meals, and were only now beginning to find out that it was bad, and several eminent diet specialists had set the fashion in London of telling patients not to drink with their meals. But that might be pushed too far, and it was not invariably the case that people lost their indigestion when fluid was cut off at meals, and he believed it was the exception.

He presumed those were persons whose gastric juices were weak in quality and whose absorptive powers were deficient. He had treated many people for obesity, and, he thought, fairly successfully, but he always allowed them to take as much fluid as they liked, and indeed encouraged it, on the principle that the accumulation of fat in the body was due to wrong digestion and the retention of things which should be got rid of. He was not sure about what had been said about the abdominal muscles and the absorption of fat. He knew a gymnastic master who was very stout, but he took special exercises for his abdominal muscles, and preached that course to his pupils.

Dr. LUFF thought the society was very much indebted to Dr. Leonard Williams for his very lucid opening of the discussion, and on no point did he feel more thoroughly in accord with him than that in which he dilated upon the fondness of people, when aggregated together, whether in the dining-room, the drawing-room, the theatre, or the discussion-room, of breathing atmospheric sewage. He was convinced it was the cause of many catarrhs and many colds, and that in many it was also a cause of obesity. But why did not medical men practise what they preach? If some of his special sense-organs told him correctly—and he had been accustomed to find that they did—he was prepared to say that the occupants of the room they were in were breathing air containing 9 to 10 parts of carbonic acid per 10,000 where they ought not to breathe more than 4 or 5. He never left one of the meetings of the Society without feeling that he was getting obese from the deficient oxygenation going on in his person.

In regard to the treatment of obesity, everything must depend upon the cause of the obesity. He thought the first thing the medical man should ascertain was as to what were the main causes of the obesity. The majority of cases of obesity which required treatment were those due to the ingestion of either too much fat or too much fat-forming food or foods. Such cases were easy enough to treat; they merely required careful dieting. In such cases he would not administer thyroid gland extract. He regarded it as an utter

abuse of what in some conditions was a valuable drug to give it to individuals to allow them to continue in their bad habits. Where the obesity was due to erroneous feeding he confined his attention to the correction of the diet. But with regard to the second class of case mentioned by Dr. Leonard Williams, those in which the main factor in the production of obesity was the deficient oxygenation which was going on, one met with it in persons who, when reaching middle life, did not alter their dietary, but did alter the amount of exercise they took. One also met with it in a large class of anæmic cases where, from the lack of introduction of sufficient oxygen into the body, obesity occurred. In what he would call anæmic obesity thyroid extract was of immense value. Of course it must be given with judgment, and during its administration constant observation must be made of the renal excretion and also, as the opener of the discussion had mentioned, of the skin. If there was the slightest albuminuria, or other indication of marked diminution of nitrogenous excretion going on, thyroid extract should be discontinued at once. The heart and pulse must also be frequently examined. Another common cause of obesity—and these cases were difficult to treat—was heredity. Alteration of diet for such availed but little. It seemed that they had inherited some vice of metabolism, and the patients could not avoid becoming obese. In such cases also thyroid extract was of immense value, given with the precautions he had already outlined. A rarer, but scientifically interesting, class of cases was that in which there was a withdrawal of some secretion, or tissue or organ which exercised some peculiar influence on the tissues generally. He referred to cases of obesity from castration, or from the removal of both ovaries. Those were, to him, of intense interest as showing interference with some trophic influences, or else the direct removal of a secretion which had some *modus operandi* in connection with general metabolism.

Lastly, there was the small class of cases which Dr. Mouillot had referred to at the Society, and of which he (Dr. Luff) had seen a few cases. They were cases akin to myxœdema, but without the monotonous sad speech met with

in myxœdematous patients and without their direct affection of the thyroid gland. He referred to those cases in which Dr. Mouillot said they became bulky rather than fat; in the subcutaneous tissues some mucoid substance collected, which felt quite different from fat when the skin was pinched. Such cases did extremely well on thyroid extract, and dieting was of very little use to them.

With regard to water-drinking, so far as he was aware, man was the only animal that drank with his meals, and he was not sure it would not be better to copy some of the lower animals as to the time of drinking. In the treatment of obesity it was most important to, as far as possible, induce patients not to drink with their meals. But there was a prevailing opinion among the public, and a most pernicious opinion it was, that they would be able to reduce their weight by taking but little fluid to drink. He was constantly being told by fat patients that they could not reduce their weight, although they took as little fluid as possible. The amount of fluid taken by the obese person should be in excess of the normal amount, and should be taken between meals, preferably one and a half hours before meals. It should be water in the purest form obtainable, and about four pints should be taken each day. For obesity, flushing of the kidneys and stimulation of the skin was most desirable.

With regard to diaphoresis, he agreed with one of the speakers that the diaphoresis should be of short duration, and should be followed by a good reaction in the shape of the application of cold water. What, in his opinion, was far preferable to the Turkish bath was an electric light bath, followed by a cold douche. He had ceased to use Turkish baths because he objected to breathing again air which had already been breathed by others during the day and week. He was told that such places were ventilated once a week, namely, on Sunday afternoons. The depression of the heart which frequently followed a Turkish bath was simply due to the abominable atmosphere of the hot rooms. When it was necessary to put patients through a sweating process he preferred an electric light bath. The patient sat in a pure atmos-

phere, and the windows might be open meanwhile. A patient who was in such a bath for a quarter of an hour would generally have been sweating seven minutes, which was sufficient and then he stepped out and had a cold douche, with, consequently, a splendid reaction. He did not believe the sweating reduced the weight; the patients must take more water afterwards to make up for the loss by perspiration. It was the splendid reaction which, in his opinion, did so much good.

Dr. PARKES WEBER said the points in Dr. Williams's paper were given with such lucidity and clearness that it enabled one to pick out readily any points one wished to comment upon. The application of heat to the skin, whether it increased or diminished metabolic processes, did in some persons tend to produce increase rather than decrease in the weight of the body. Dr. Altdorfer, who as resident doctor at St. Anne's Hill establishment in County Cork, had excellent opportunities for observing the effects of Turkish baths, was very decided on this subject. In the *Dublin Journal of Medical Science* for August, 1899, he wrote that Turkish baths, in his experience, tended rather to cause a gain in weight than a loss, and that an increase of 2 lbs. per week was a usual occurrence. In order to reduce a person by Turkish baths the process had to be so modified that the heat was employed for only a short time, and that a liberal use was made of cold-water applications in order to cause a loss of heat, which had to be made good by increased catabolism in the tissues. With regard to drinking fluid with meals, he did not feel that he quite agreed with Dr. Williams's explanation, although that gentleman was probably quite right in his idea that in certain cases it helped people to become fat. Dr. Williams's explanation was that drinking water at meals helped to wash the food through the stomach, and that consequently people ate more. Dr. Weber believed copious draughts at meals tended to keep the food in the stomach for a rather longer time. Observations had shown that if water was taken on an empty stomach it was soon got rid of, but if the person ate at the same time the bulk of the fluid remained until the food was digested. That was the generally accepted view, and he thought it was likely

to be the correct one. If so, there might be something about the retention of food in the stomach which tended to obesity. Sir Lauder Brunton had suggested (*Trans. Medical Society*, vol. xxv., p. 116) that taking the meals dry might cause a difference in the digestive process with less formation of fat. Then, in regard to mastication and its effects, Dr. Weber mentioned that if people bolted their food without properly masticating it, the stomach had obviously more difficult work to do, and the food was consequently longer retained in that organ. Well-masticated food was more easily acted upon by the gastric secretion, and was retained a shorter time in the stomach. Peculiar care in mastication was opposed to the development of obesity. Then, again, people who went to sleep or became drowsy after a meal, especially in the evening, showed, to his mind, a peculiar tendency to become fat. The effect of sleep too soon after meals was to keep the food in the stomach a longer time. Dr. Weber thought that undue delay of food in the stomach (possibly by favouring certain fermentative processes) tended to the laying on of fat. In fact, though he admitted that persons who ate hurriedly and "washed their food down," and slept too soon after dinner (during the height of gastric digestion), often ate too much, he suspected that undue delay of food in the stomach had likewise often something to do with the resulting obesity. He wished to make it clear that he did not mean that ordinary people should not drink with their meals. Even in obesity it was only the liquid taken with meals which should be strictly limited, but patients might take water an hour before meals if they felt thirsty.

Mr. Francis Jaffrey said he had tried most of the remedies suggested for obesity on himself and had found them all wanting unless they were kept up continually. The first thing noticed was loss of sleep, and that he suffered from most of all; he was unable to sleep more than three or four hours at a time. He would wake up very early in the morning and be unable to sleep again. The second discomfort was constipation, which he suffered from greatly during the whole time. And whether he drank water with his meals or not, or whether he did Banting, or took thyroid extract, he

suffered intense pain in the lumbar region, so much so that it might have been thought he had stone in the kidney. When he went back to his ordinary diet all the symptoms disappeared in two or three days. Dr. Williams had drawn attention to the undesirability of carrying out Banting too strictly; in this the speaker entirely agreed.* He had a patient at St. George's Hospital, aged 54, who had been told to try Banting, and he did so without any medical supervision. When seen he had suppression of urine from acute nephritis, which was almost certainly due to the treatment.

Dr. SOLLY said preceding speakers had expressed on some points very much what he had it in his mind to say, and those he would therefore pass over. At Harrogate obese persons went for treatment on account of the waters being purgative. His belief was that the giving of water in large quantities was a very important part of the treatment; but it should distinctly be given sometime before meals, not in connection with them. With regard to baths, he assumed Dr. Williams's condemnation of warm baths applied only to those of such a temperature as to leave an enervating effect; that he was not referring to really hot baths, because there was a large difference between "warm," say 98° F., and "hot," say from 105° upwards. A really hot, or really cold, bath would get over the difficulty because what was required was the stimulating effect on the skin. After he had recovered from typhoid fever he felt he could not take his usual cold bath, but he was greatly indebted to the advice of Dr. Sidney Ringer, who said, "Never mind; take a hot one." He did so, so hot that he was glad to get out again quickly, and carried this out every morning for several years after the illness. As a result of improving health he had now been able to resume his "cold tub"; but so long as the stimulant effect was forthcoming it did not matter whether the bath was hot or cold.

Dr. DOUGLAS KERR said a point which often struck him was that not only in elderly people, but also in young people, with a hereditary tendency to obesity there was a habit of

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* *The Lancet*, March 3, 1900, p. 612.

shallow breathing. If the air capacity of such persons were measured it would mostly be found astonishingly deficient. And if some well-regulated scheme of breathing exercises were carried out by such people they would, without any other treatment, be found to have lost weight. If they were made to breath deeply for long periods, such as by climbing a hill slowly, it would produce a distinctly beneficial effect.

The debate at this point was, by resolution, adjourned until the next meeting.

BRITISH BALNEOLOGICAL AND CLIMATOLOGICAL SOCIETY.

THURSDAY, APRIL 18, 1904.

SOME ASPECTS OF OBESITY.

DISCUSSION RE-OPENED BY WILLIAM BAIN, M.D., M.R.C.P. (HARROGATE).

IN re-opening the discussion on some aspects of obesity, I have been asked to deal with the subject from the physiological standpoint. Compliance with this request necessitates the introduction of matter which may be considered somewhat outside the scope of this discussion; however, such matter will be briefly referred to, and practical points of interest receive due consideration. While heredity plays an important part in the causation of this affection, the chief factors are an excessive carbohydrate dietary and indolent habits.

The essential proximate principles of which a diet is composed are proteids, fats, carbohydrates, salts and water. An adequate diet for a man of 11 stones in the prime of life should approximately consist of proteid 100 grms., fats 100 grms. and carbohydrates 300 grms. These proportions are subject to considerable variations as regards age, race, climate, &c.

The calorie value of the different food stuffs varies a good deal. The average value of proteid is 4·1, that is 1 grm. of proteid oxidised to urea yields 4·1 kilogram. degrees of heat. Fat yields 9·3 and carbohydrate 4·1, but as a mixed diet consists largely of the latter, it is the chief source of animal heat. Before referring to the assimilation of fat, it is advisable to glance at the digestion of carbohydrate and fat.

If an excess of *dextrose* be introduced into the intestine, dextrose appears in the lymph and urine, but an excessive quantity of starch, given in a similar way, is completely assimilated, the explanation being that dextrose is absorbed so

rapidly that the liver and intestinal cells have not sufficient time to deal with it fully.

Starch grains consist of granulose enclosed in an envelope of cellulose. Only the granulose is acted upon by ptyalin, converting it first into dextrin and then into maltose. For about half an hour after digestion has begun, ptyalin will act more vigorously than in the mouth, being favoured by the weakly acid reaction due to lactic and traces of butyric and acetic acids. The starch and dextrin which have escaped the action of ptyalin are converted into maltose by amylopsin. The carbohydrates are mainly absorbed as dextrose or levulose, as these are the only two forms found in the blood. They are also the final sugars formed in the intestinal canal. The conversion of maltose into dextrose is brought about by invertin of the succus entericus, or by the cells of the intestinal villi.

The whole of the fats pass into the duodenum chemically unchanged. Previous to absorption fats are melted, emulsified and broken up into fatty acids and glycerine by the fat splitting ferment steapsin. The acids form soaps with the alkali of the pancreatic juice. Fat is absorbed as fatty acids or soaps. The path of absorption is the lymph. If the total quantity passing into the lymph be measured, there is a marked deficiency contrasted with the quantity absorbed. The amount found in the portal blood is not greater than that in the general circulation, therefore a portion must be utilised by the cells in the formation of non-fatty products.

The occurrence of an excessive deposition of fat may be due either to an abnormal production or to diminished utilisation of fat. Looking at the whole question from a physiological point of view, we must first ascertain what is known as to the normal formation and the normal utilisation of fat within the body. In connection with the first of these problems, we shall consider which of the three chief food stuffs are concerned in fat formation. It is natural to suppose that the fatty foods would play the chief part, but this is not correct, because fat does not bulk largely in an ordinary diet, and the power of absorption of fat is limited. There is no

doubt that that portion of the fat of a meal which enters the lacteals is deposited as fat in diverse tissues, particularly in the connective tissue cells and in the liver.

The part played by the food proteid in fat formation is apparently a minor one. A few hours after absorption of proteid an amount of nitrogen is eliminated practically equivalent to that contained in the absorbed proteid, but the carbon of this particular proteid is not completely eliminated until some time later, and if the amount of nitrogenous food be excessive, it may be stored as fat.

Fat formation is chiefly linked with the assimilation of carbohydrate. Carbohydrates form the greater bulk of an ordinary diet, and are very readily absorbed and disposed of within the body. The amount of carbohydrate, dextrose and glycogen, present in the body at different times varies, but by no means to the extent which would account for the large quantity ordinarily absorbed from meals rich in carbohydrate. Hence the absorbed carbohydrate is either at once utilised, or it must be converted into some other material and thus stored. We know that the latter is the case and that the substance stored is fat. The liver is largely concerned in this conversion, but whether other tissues also possess the same potentialities is not clear. In all probability the muscles do, and possibly other tissues as well. This power is exemplified by the occurrence of fatty degeneration. As regards the formation of fat from carbohydrate, it is most remarkable that a partially oxidised carbon compound should be so readily converted into one in which the terminal carbon atom is alone oxidised. Moreover, while the carbohydrate utilised in this synthesis only possesses six carbon atoms, the fatty acids formed therefrom possess many more, the most common being those with chains of sixteen and eighteen carbon atoms.

While fat formation is thus largely due to the carbohydrate of the food, it still remains an open question whether in a normal animal which is neither gaining nor losing weight, any of the carbohydrate absorbed is temporarily stored as fat. It may be that only an excess of carbohydrate becomes converted into fat, and that when a quantity just sufficient for the

requirements of the organism is taken, it is immediately built into the tissues or stored for a short time as glycogen.

Turning to the other side of the question, we have to consider the normal utilisation of fat in the body. In starvation the small store of carbohydrate is very quickly used up, and the first tissue to disappear in quantity is fat. How the fat is utilised in these cases we have no certain knowledge. We know that both the combustion of carbohydrate and fat is greatly accelerated by muscular exercise, and further that the muscles largely depend for their power of performing work upon carbohydrate material. The view has therefore continuously gained ground that the fat of the tissues is first converted into carbohydrate, and then incorporated within the muscular or other tissues. Fat is undoubtedly a potent heat producer, and we find that in very cold climates it plays a vastly more important *rôle* in the dietary than in warmer climates ; but the mode in which the fat is directly utilised is again unknown. The fact, however, is important as indicating measures by which the consumption of fat may be accelerated very greatly by increasing the loss of heat from the surface of the body. This brief review of general fat metabolism explains some of the reasons for the methods adopted in fattening animals. The most important of these are a rich carbohydrate diet, prevention of exercise, keeping the animals warm and in the dark, and lastly, the production of an artificial anæmia by repeated bleedings, thus diminishing the oxygen carrying power of the blood. We see that these partly favour fat deposition, and partly favour decreased fat combustion.

From the pathological side there are other facts of importance. It is well known that after removal of the pancreas a severe diabetic state is produced, the loss of sugar being accompanied by a rapid disappearance of the fat. It is stated that in obesity there is an increased development of the pancreas. If it be true, it is very interesting. The pancreas is actively concerned in carbohydrate metabolism, and probably in some way prevents the formation of carbohydrate from fat. The other morbid changes observed in obesity are that the lungs, kidneys, spleen and lymphatic glands are small, and that

the liver and heart are enlarged, the cavities of the latter being frequently dilated.

Each case of obesity should be treated on its merits. It is absolutely unscientific to lay down for every patient the same fixed rules, either as regards diet, exercise or drugs. It should be borne in mind that in some of these cases many of the organs are functionally disordered, and there may be organic disease, therefore they require very careful consideration. The system generally in vogue of having special diets, designed for all comers, should be condemned. The essential elements in the treatment are: regulated exercise, the restriction of the carbohydrate and fatty materials of the food, living an out-door life if possible, and combating any tendency toward anæmia. The acceleration of heat loss has been mentioned. I wish to emphasise the fact that a restricted diet alone is not sufficient to effect safely a marked reduction in the weight. It must be combined with some suitable form of exercise. It is generally advisable to begin with massage, unless the degree of obesity is moderate; but later on the patient must be induced to take regular exercise. The weight should not be reduced more than three lbs. a week—about two lbs. is recommended. Alcohol should be forbidden, and tea or coffee taken well diluted. Fluids should be drunk between meals. It is found that if fluids are withheld during a meal, the patient eats less. Dr. Williams's assertion that taking fluids with meals enables the food to pass more rapidly out of the stomach, and thereby leads to the deposition of fat, requires corroboration. Warm baths from 85° to 90° F. in the morning and before dinner are useful adjuncts to treatment. Cold baths are physiologically wrong. d'Arsonval applications are useful. In selected cases thyroid extract is efficacious. If the hæmoglobin value of the blood is not above 90 per cent., iron should be administered. I agree with Dr. Williams regarding the advisability of having well ventilated rooms, but I decidedly object to draughts. Our architects do not seem to appreciate the necessity for giving us a good supply of oxygen. Surely Dr. Williams must have been joking when he says that he declines to believe in a chill until a definition of the term is forthcoming. I wonder

if he believes in shock. Perhaps if he catches a chill through wearing cotten under-garments or sitting in a draught, he might be disposed to regard the term with more respect. His condemnation of flannel underclothing is scarcely scientific. Flannel prevents sudden evaporation from the surface of the body, and is therefore an excellent precautionary measure against chills. Dr. Williams asserts that brain work in the study is more provocative of hunger than open air exercise. I would suggest a simple experiment to test the truth of this statement. Let him arrange two days ; one for a literary feast. He may select any subject he likes—the chemistry of the sugars or the fiscal problem. The second day to be devoted to golf—three rounds of eighteen holes. The amount of food consumed each day can easily be ascertained. I venture to predict that the result of this experiment will not be in accordance with Dr. Williams's present views on the subject, unless he exercises an abnormal degree of self-control in order to make the results agree with his theory.

Dr. CLIPPINGDALE desired to allude to the last observation of Dr. Bain, as to the connection of obesity with sedentary habits and intellectual work. It was commonly supposed that obesity was incompatible with a high degree of intellect. He hoped, however, that for the sake of suffering humanity that did not apply to the medical profession. Some time ago he had under care the editor of one of the daily papers, who was an intensely stout man, and whose dinner consisted of twenty-four native oysters, a wild duck and a bottle of champagne, and yet after that dinner he wrote two leaders in his paper by midnight. In history intellectual men were often found to have been of sedentary habits and stout, such as Dr. Johnson and Gross, the antiquary. In all probability high intellectual capacity, if associated with tranquillity of mind, would allow obesity to occur. If, however, there was a morbid or melancholy temperament thinness resulted. That seemed to have been recognised by Julius Cæsar, for Shakespeare made him say, "Let me have men about me that are fat, sleek-headed men and such as sleep o' nights. Yon Cassius is too thin. He thinks too much. Such men are dangerous."

Dr. ALEXANDER MORISON remarked that he had little to say on the subject under discussion, as little remained for comment after the full debate. Most of those present could remember when the attention paid to the subject of dietetics was not by any means as great as at the present day. On one occasion he asked the late Sir William Jenner to see a patient, and after a full examination, he asked Sir William whether he thought any definite instructions as to diet were necessary. In reply he said with an amused twinkle in his eye, "Dietary ? oh, let him eat anything." That was the usual attitude of the time, and he thought there was some sound wisdom in it. Dr. Bain had already referred to the mistake of going upon any very rigid system. It was not practicable to have a printed formula handed to patients, because it might not suit particular individuals. Having fixed something like a normal average, as physiologists had done, one could know fairly well the lines on which to go, and much of the mystery which surrounds adult and baby feeding is capable of simplification, so that he who runs may read. Of the three great classes of foods, the error seemed to occur in the albuminates and carbohydrates. It is related that when Peter the Great was in England his attendants drank lamp oil to such an extent that the people of London had to sit in darkness for a time ; but such an example was not likely to be met with again. Yet errors in the carbohydrate and albuminate direction frequently indicated some necessity on the part of the system. For instance, men working hard, whether mentally or bodily, required during the active period of life, to take a good deal of albuminous food, especially to renew muscular and nervous tissue. An important point, which he had hoped to bring forward on his own initiative—but it was dealt with by Dr. Bain—was as to whether the person to be treated for obesity was organically sound, or whether he had diseased organs. A man might be organically sound but yet exhausted, and might have to be treated, *pro tem.*, as if he were organically diseased. In the sound fat man one could begin promptly to cut down those things which increased fat, and correct those habits which conduced to its deposition ; but it was necessary to be

extremely careful in treating a man organically diseased. At the last meeting one of the valuable points brought out was that a man's fat could not be reduced "with a light heart." To rapidly change a man's habits and reduce his sustenance might be attended with danger. He thought it probable that people had been killed by dieting rapidly and having the altered course pushed imprudently. Occasionally one encountered fat people who were organically very strong, and as had been pointed out, the organ which was probably worse hit by excessive fat was the heart. The deposition of fat acted by splitting up the muscle bundles and thereby causing dilatation, and indirectly by increasing the area for irrigation and the difficulty of doing it. On the other hand, one sometimes found hearts embedded in fat, and the whole body encased in it, but in which the heart itself was a very good organ and required no treatment. Some time ago he was consulted by a lady weighing 18 stones. She had an excellent heart, but complained of having what she called gout in her feet. She simply had an aching instep due to the weight of her body, and a little orthopædic *medicine*—not surgery—by taking 2 stones off her weight, removed her symptoms and the arch of her foot served her well afterwards. In many cases it was the condition of the heart which regulated the strenuousness and rapidity of the physician's efforts. The method he had himself followed and found most useful was one for which he was indebted to the teaching of the late Professor Erlich, of Munich, a man who always saw the safe track in the middle course between those extremes, that is, which were known by the name of Banting on the one side and Ebstein on the other. In the case of those who ate excessively there should be a diminution of fat-formers, but care should be taken to avoid touching zero in any of them. Where obesity lay at the bottom of a person's troubles one should strengthen the individual before attempting to reduce the fat, especially where organic disease existed. The other point he wished to refer to was touched upon by Dr. Luff at the last meeting, namely, the administration of thyroid extract in the reduction of fat. He (Dr. Morison) had an objection

to using that drug unless the circumstances were exceptional. Where he had found it most valuable was in cases in which the obesity seemed to mark a certain degree of hypothyroidism or myxœdema. A person need not necessarily have diminished thyroid secretion because he happened to be fat; and the injection of more thyroid into him when he had a normally acting gland, was more likely to induce hyperthyroidism than to do any real good. And if in the same individual there was organic crippling, an element of risk was imparted to the case which might have been avoided had the unnecessary extract not been used. Still, there were cases in which there were ill-marked symptoms of a tendency to myxœdema, and in whom the administration of thyroid produced happy results. Eight years ago he was consulted by a lady who did not make much progress under ordinary treatment, until he suspected a degree of myxœdema the basis of her obesity, defective circulation. He prescribed thyroid experimentally and at the same time regulated her diet. The benefit was so marked and lasting that she wrote him recently stating that she had never had occasion since her last interview to consult the faculty, and was able to maintain her health by carrying out the directions as to diet and taking a little thyroid extract occasionally.

He concluded by expressing his appreciation of Dr. Leonard Williams' paper.

Dr. BEZLY THORNE said his remarks would bear more especially upon the relation of obesity to the circulatory organs. It would be known by those present that that distinguished physician and observer Bouchard, ranked obesity with what he called "arthritism," and that it was thus associated with gout, rheumatism, chlorosis and other diseases of that family. In those affections, and particularly in gout and neurasthenic conditions, venosity was one very prominent feature. It was also well known that obesity was liable to come on after the abeyance of the sexual activity. It was also liable to come on after excessive bleeding, and in connection with affections which involved deterioration of the hæmoglobin. Among the obese, also, there were four forms of death which

were more common than among other people, namely, syncope, apoplexy from atheroma, œdema leading to death, and angina pectoris. The reason he laid stress on those points was that peripheral resistance, high pressure, and anything leading to venosity would produce obesity. Idle blood deposited fat, therefore it was impossible to regard obesity from the dietary standpoint alone ; indeed, as had been said in the discussion, it was dangerous to do so. He felt reluctantly compelled to come under the ban of Dr. Bain. He (Dr. Thorne) had noticed for a great many years that he became much more hungry when intellectually engaged than when he was out fishing in Scotland or Norway, or otherwise living in the open air. He was surprised when he made the observation upon himself, but that experience was confirmed by that of others, including Sir James Paget, when he was at the zenith of his powers.

Dr. SYMES THOMPSON remarked, in reference to the last point brought forward by Dr. Bezly Thorne, that the same point was brought under his notice years ago by a distinguished Member of Parliament, who noticed how much greater was his appetite when spending a loiterous morning, than when he was out in the open-air anxiously arranging the management of his estate. He thought that the nitrogen of the open-air availed one for food, whereas indoors it was inadequate. Since then he had himself noticed the same thing, but he was not prepared to give an explanation of it. As his work took him a good deal in the direction of life assurance he had often had thrust upon him the serious danger to life which undue stoutness brought, a danger greater than that possessed by any other general condition short of disease. It was a matter of importance that the Society should discuss such a subject. It afforded a special field for the discussion because, though dieting was important, exercise was even more important. In the varied selection of the health resorts represented by the members of the Society, there were great opportunities for the encouragement of that exercise which was so essential, especially if combined with facilities for elimination. Recognising how obesity threatened life, physicians should use their

utmost endeavour to remove the evil, and not allow those who were suffering from it to drift to a speedy death, which might be avoided by utilising the opportunities afforded by the Society.

Dr. ROBERT BARNES said it was altogether beyond the time for him to make a scientific study of the question, but much instruction could be derived by comparing the conditions of the races of different climates. Recently he had spent some time in Egypt, and in journeying up the Nile. The Arabs there, who formed the bulk of the population, led an active life, and were small and thin ; but on coming to the Riviera, north of the Mediterranean, the people in the same station of life, *i.e.*, the poor people, were found to be generally very fat. In Egypt the people lived very sparingly indeed, and seemed to eat but little more than vegetables ; but in and about Sicily the people ate a great deal of macaroni. and it was that, coupled with climate, rather than idleness, which was the cause of their fatness. But there were some exceptional persons on the Nile, mostly policemen and guides who were stout. Those persons came into contact with English and other tourists, who fed them well. In Egypt, as in London, the policemen managed to get well fed down in the areas, and no doubt they were spoilt and pampered by domestics there, much as they were in the Metropolis. In Egypt the horses and other animals as well as the people were badly fed, and north of the Mediterranean, like the men and women, the animals were also found to be fatter than they were in Egypt. By comparing the modes of life of the different races and the climatic differences, much help would be obtained towards the solution of the problem under discussion.

Dr. BAYNES agreed with Dr. Bezly Thorne's remarks about venosity being a prominent feature of gout and obesity. In the treatment of obesity he had found great benefit from the use of strong galvanic currents, with the negative pole over the abdomen, and the positive over the thighs and lumbar region. Currents could be used up to 150 to 200 milliampères toleration for which was established by going up to a certain

height and then reducing; then going to a higher strength and reducing again. That would reduce the weight in even one sitting; and after one or two months one could bring about a reduction of one or two stones. With that he was in the habit of combining high frequency currents, and he desired the patient to take plenty of exercise. If it were a heart case they could not be severe exercises, so perhaps the best form would be some form of modified Schott, always watching the patient carrying out faradism to the muscles afterwards. High frequency currents themselves, he thought, had a tendency to reduce weight. He would begin with 80 milliampères and run up to 120, then reduce to 100. It was applied direct to the skin.

Dr. NIGHTINGALE said he had a high regard for Dr. Leonard Williams, but was not prepared to lavish unstinted praise on his paper, for in that he seemed to have gone out of his way to ridicule some of one's most cherished notions—flannel wearing, hot water, draughts and chills. It must have been a satisfaction to notice that at the dinner all seemed to take the author's advice, for none seemed to drink any water, either before or after the meal. He thought he could say something about flannel and chills. Those who, like himself, had had to live in the Tropics for many years, had to get accustomed to perpetual Turkish baths at a temperature of some 80°. The only way to live in the Tropics was to always wear flannel next the skin, always to take lukewarm or very hot baths, and to look upon a draught, with the resulting chill, as a most dangerous thing. The normal man who followed out those rules became thin and kept in health. But those who gave way to the thirst acquired in the Tropics, owing to excessive perspiration, became stout and flabby, and very soon assumed an aldermanic appearance. It was true that one did not drink water in the Tropics, but there was a good substitute, and that was perhaps one reason why Europeans did not keep well there. He had noticed that new-comers wore linen or cotton next the skin and flannel over it; and they also took cold baths and sat in draughts. But they found they had to give up that sort of thing, otherwise they did not

survive longer than a few months. He did not understand whether Dr. Luff meant the electric light bath to be taken instead of the water bath, but if the body was in a temperature of 120° while the head was in the ordinary atmosphere at 60°, it could not be a very good thing for the patient. With regard to the reduction of obesity, he (Dr. Nightingale) had found the high frequency current of the greatest value, as it would reduce the weight in a few minutes. His practice was to weigh the patient before and immediately after the application, and on going over a list of 300 such weights, he found there had been a loss of ½ lb. to 2 lbs. in ten minutes; also that persons subjected to the current two or three times a week steadily diminished in weight; and it was possible to lose 7 lbs. to 14 lbs. a month without any serious consequences. With regard to the thinness of Asiatics, which was referred to by Dr. Barnes, the Chinese, who ate only two meals a day, consumed enormous quantities of rice. They worked hard upon it, and in very hot weather, up to 150° in the sun, and they drank very little. But when such Chinamen grew rich, as coolies sometimes did, and began to eat, in addition to the rice, pork and fowls and fruit, and drank large quantities of tea and brandy, the majority of them became enormously stout. It was nearly always the same with the Indian races; if they kept to one kind of food they could do an immense amount of hard work upon it, and they kept thin, but when they took to European food, especially meat and alcohol, together with their native curry and rice, they soon became stout and unwieldy.

Dr. SEPTIMUS SUNDERLAND said he had little to offer in the way of suggestions as to the treatment of obesity, but he was very grateful for what he had learned from Dr. Leonard Williams and Dr. Bain. A point he wished to mention was, that people who were inclined to obesity made a great mistake by allowing their obesity to gain upon them before attempting to reduce it by a proper dietary and the methods set forth in the two excellent papers which had been contributed by the introducers of the discussion. In his own practice, if he saw a patient whom he had not met for some time, and found she

was getting stouter, he told her she was getting fat and that it was advisable to begin to diet herself before she increased to the extent of two or three stones. Another point he wished to mention concerned the abuse of the thyroid gland extract. Both the papers had pointed out the mistake of pushing the administration of that substance too far and with that view he quite agreed. A few months ago, however, he encountered a case, in a lady, which did not impress that fact upon him because she had not suffered bad effects, although she had been in the habit of taking three and four tabloids of 5 grs. each three times a day, and said she had continued them for a couple of months. When he first knew her, a year ago, she was very stout, and a few months afterwards she lost her husband. Three months later she appeared to have lost quite 1½ stones in weight, and he assumed that as she had been treating herself for obesity she might be considering the advisability of another matrimonial venture. He was somewhat amused by the remarks of Dr. Clippingdale; he (Dr. Sunderland) never had reason to think intellect and obesity did not run together in the same individual. Probably some Fellows knew the late Mr. Samuel Pope, the famous Parliamentary lawyer, who weighed 20 stones or more, and had to be wheeled about in a bath-chair for several years before his death. He was a man of great intellectual capacity, as well as of great weight. In his house was a bath large enough to contain two or three normal-sized persons. Mr. Pope used to earn by his brains £15,000 to £20,000 a year, which probably could not be accomplished by many fools. Among the Fellows of the Society there were several who were inclined to stoutness, but who were known to be of great intellectual capacity, and distinguished in the branches of the profession which they practised. He agreed with Dr. Clippingdale that the common belief alluded to by him might be dismissed as unsound and incorrect.

Dr. GROVES said he feared he was too old-fashioned. He had been taught that Nature and Nature's laws had to be regarded, and that people were born into the world different by heredity, training and environment; and that when a man

reached middle life he must not expect to live like every other man. The attitude to take up with regard to a patient was to consider what his life had been ; so he had got into the habit of treating his patients not empirically, but in view of their past habits and the condition of their organs, and after finding out whether they had been living in accordance with Nature's laws. If they were not promoting metabolism in Nature's way, by exercise, &c., he tried to put them on to it. Some did so, but even among these he found some who remained stout, as would be expected. He found their stoutness prevented too much pressure being put upon their organs, which he thought was well. If they could not go up-hill at a steaming pace they could take it slowly, and by not putting more work on to their organs than they were accustomed to bear, the persons concerned were able to live out their days. He wished he could conform to modern notions, but he had lived too long in the world for that, and he was particularly cautious about making fresh moves, whether in the direction of high frequency currents or X-ray performances, which were putting such an amount of money into the pockets of some members of the profession. He proposed to still go on leading his patients into the paths of what he considered to be Nature's laws, just as he always tried to remind the people he had to deal with in sanitary matters that there was a law which was entirely ignored in ventilation, namely, that of the diffusion of gases.

Dr. LEON (Southsea) remarked how surprising it was to hear of the extraordinary effect of the high frequency current in rapidly reducing weight, and said he had been wondering whether any experiments had been carried out for the purpose of finding out in what way the reduction was brought about. He assumed it must be either by burning up the tissues more rapidly, *i.e.*, increased output of urea and carbonic acid, or by increasing the action of the skin and the evaporation of water. If it were simply due to increased evaporation from the skin, was the reduction of weight beneficial to the patient ? With regard to Dr. Barnes's remark concerning the fatness of the Egyptian police, he wondered whether the natives who

were fat were those who had become imbued with Western ideas and took alcohol habitually. He regarded alcohol as one of the causes of disturbed metabolism which resulted in the deposition of fat.

Dr. EWART said he had not heard the papers, but in his experience there were two types of obese people; those who were overcome by their obesity, and those who overcame it. Strong fat people were a race. The other set were a pathological production. Stoutness ran in families, and it was right for the members of those families to be fat; if one made them thin it meant that they were not their natural selves. The case was very different when dealing with pathological stoutness, and for this it was no doubt necessary to do something. Pathological obesity was the result of imperfect or deficient oxidation, and the question had arisen in his mind as to whether or not the inhalation of oxygen would help such cases. He had not made observations of any value on the subject, but his belief was that the inhalation of quantities of oxygen might give rise to thinness. If any Fellow knew of any facts in that connection he would be glad to hear them.

The PRESIDENT said he had been much interested and instructed by the speeches he had listened to, and Fellows could congratulate themselves on the small amount of repetition in the various remarks. Both before and during the discussion he had been much impressed by the question of individuality, which was so pointedly brought forward by Dr. Groves, the fact being that it was difficult to make some fat people thin, as well as to make some thin people fat. It must be within the experience of everybody that some large and indiscriminate eaters had always been very thin; but he had no explanation of the fact to offer. He joined in condemnation of the diet charts which had been, and were still, used by some medical men for distribution to their patients, under the headings of "May eat," and "May not eat." He thought every case had to be taken on its merits; it was very unlikely that a chart would fit any particular case. It was interesting to hear that Dr. Bain thought restricted diet alone was not enough to reduce weight; and in his reply he would

like him to enlarge upon that point, as he could not quite agree with it. A question which had been omitted by all speakers was the influence of the very much advertised quack remedies for obesity. Ten days ago he saw one, the name of which he had not previously known, figuring very largely in the advertisements of a lay paper. It could hardly be doubted that such remedies had some influence, otherwise it would scarcely be worth while to advertise them. He had been told that some of them owed their reducing influence to iodine or iodide. If so, it would be interesting to hear how it acted in that way. There was also the fattening influence of malt liquor. It was notorious that the man who drove the brewer's dray was an obese person; it was reasonable to conclude that his obesity was due to the malt liquor which formed, he believed, part of his wages, and it had been said, "Who drives fat oxen should himself be fat." But that did not apply to the horses which he drove, and which were fat possibly because they were largely fed upon "the brewer's grains." He was not quite content with the explanation that drinking during meals tended to reduce obesity merely by making a person eat less food; there seemed to be a basis of fact wanting there. He had been struck by the use of fat and of over-feeding in cases of Graves's disease. He was surprised to hear that cold baths were physiologically wrong, though admittedly they were disagreeable to some people, and those people would be better without them; but they could hardly be wrong for those who enjoyed them. He was against Dr. Leonard Williams in the matter of draughts, of thin under-clothing, and in regard to the dissuasion from the use of flannel next the skin. With regard to the effect of thinking and of exercise, the latter was illustrated by one speaker by the game of golf; but he would suggest that much mental anguish was experienced at golf, and would almost go so far as to say that a good deal of intellect was required to play it properly. He had been struck by the large amount of food taken by navvies, and persons who dug trenches, who must produce many foot-tons of energy in the course of a day, but they did not become fat. It was very interesting to hear what

could be accomplished by high frequency currents, even, as stated, in a single sitting, but no explanation of the ***modus operandi*** had been offered, and he was not prepared with one. Dr. Nightingale seemed to regard the box Turkish bath, now so much used, in which the body was parboiled and the head at a temperature of about 60°, as necessarily an evil thing; but he thought it was notorious that in an ordinary Turkish bath a cold wet towel around one's head reduced the temperature of it and was most comforting. It had been suggested that the intake of oxygen might reduce obesity. He lived in a place where oxygen—not ozone—was present in greater degree than in that room, and he did not think obesity was common among his neighbours, therefore he was inclined to agree with that suggestion. There was another character in Shakespeare who alluded to obesity, but not in the same sense as the one quoted :—

> **" Imperial Cæsar, dead and turned to clay**
> **Might stop a hole to keep the cold away."**

Dr. BAIN, in reply, said he thought Dr. Ewart's suggestion about the inhalation of oxygen was worthy of a trial. Dr. Kerr mentioned at the last meeting that he frequently noticed that obese people had shallow breathing, and it was known pathologically that their lungs were small. He had mentioned that cold baths were physiologically wrong. Some years ago he discussed the subject with two distinguished physiologists and they were both of the opinion he had expressed. Dr. Nightingale's observations that a reduction from ½ to 2 lbs. can be effected at one sitting by the d'Arsonval current was extraordinarily interesting. Though Dr. Groves applied to himself the term "old fashioned," he put the case in a nutshell. He endeavoured to teach his patients to lead normal lives, and that was what we all should do. With regard to physical exercise *versus* mental effort in promoting appetite, a game of golf gave him a much better appetite than working in the study; and he thought it was generally recognised that open-air exercise did produce a keener appetite than did literary work. He had asked Dr. Leonard Williams if he objected to a little gentle banter, and he replied that he could banter him

as much as he liked, but he (Dr. Williams) had the right to reply.

Dr. LEONARD WILLIAMS, in reply, said he thought he could at any rate congratulate himself on one thing, namely, that he had provoked a discussion. He prided himself in the second place that, having ridden full tilt against some of the most deeply-rooted prejudices prevailing in the profession, no member who had spoken had ventured to contradict a word he had said on these subjects. In his paper he (Dr. Williams) said that brain-work in the study was a greater promoter of hunger than exercise taken in the open air. That he had always imagined to be axiomatic. He admitted that his own observations, in so far as he had made any, had been made upon himself, that is upon a mediocre person with a normal brain, and if Dr. Bain's experiences were different, all he could say was that Dr. Bain's brain was not a normal one, though he refrained from indicating in which direction the abnormality was to be sought. But with regard to the physiological wickedness of wearing flannel next the skin, and the monstrosity of not living in the open air as far as possible, not a single speaker had advanced one argument against him. The President, Dr. Bain and Dr. Nightingale had all put the matter discreetly aside. They said they did not agree with him, but they did not advance a single argument to show the basis of their disagreement. Dr. Bain, who appeared to prefer the oracular to the argumentative method, said that his (Dr. Williams's) statements were physiologically unsound. "Physiologically" was a good word to use in this connection, it was like Mesopotamia, in that it suggested so much without meaning anything at all. The President said gently enough that he was against him. That was interesting, but he would have liked to have heard why. He (Dr. Williams) was prepared to demonstrate what he said about the absorptive power of flannel and other materials, but the President was against him. Dr. Nightingale wished him to go to the Tropics, but did not say how hot the climate was to which he was to go; possibly, except for the usual amenities of debate, he would have told him to go to a very warm place indeed. But Dr. Nightingale did not say a word to support the statement he

made. Moreover, those present did not live in the Tropics, but in England, whose climate was far from tropical. He had never lived in the Tropics, and could not say what was best there. But the practice of the ordinary Englishman in the Tropics was not the final word of wisdom in such a matter; the practice of the native was much more instructive, and the native did not wear flannel next his skin—he wore nothing; and if anything was to be learnt from the Tropics on the subject, it was that nothing, or as near nothing as possible, should be worn next the skin. With regard to chills and draughts, people, both outside and inside the profession, were very fond of talking about them, and he expected to hear a definition of a chill. He had pointed out that ordinary colds in the head and other catarrhs of the air passages had no more to do with chills than with the man in the moon. Colds, catarrh—nasal, laryngeal and bronchial—were due to microbic activity, and to nothing else. They were acquired by sitting in a room which was rather less stuffy than the one they were then occupying, in which people were content to sit and inhale the pulmonary excreta of other persons. People went out into the open air afterwards, and attributed to the fresh air the "cold," which, in reality, had been acquired by irritation of the mucous membrane of the air passages in an unventilated apartment. A chill was popularly supposed to produce anything, from neuralgia to typhoid fever and pneumonia, and if a physician wished to cloak his ignorance when confronted with a case of difficult diagnosis, he had only to say it was a chill on the liver, and every one was abundantly satisfied. The combination of "chill" and "liver" is supremely satisfactory to the ordinary layman. His friends said that draughts were very dangerous things; he agreed they were often unpleasant, but how could such a room as they were in be ventilated without a draught? If there was no circulation of air there was no ventilation. It might be that a draught directed to a couple of square inches of the skin for any length of time would cause a temporary myalgia, but to say that a draught which was necessary to the efficient ventilation of a room was anything but beneficial was not only nonsense, but absolute and pernicious nonsense.

Original Communications.

ON THE PHYSIOLOGICAL ACTION OF THE NAUHEIM SPRINGS, AND THE INDICATIONS FOR THEIR USE IN CIRCULATORY DISORDERS.*

BY PAUL C. FRANZE, M.D. (BAD NAUHEIM).

THE recent and remarkable increase in Nauheim's fame as a health resort, more especially in the cure of cardiac complaints, is perhaps most markedly manifested in its steadily augmenting influx of visitors from various countries, amongst whom the increase of the English visitors is greatest.

Although Nauheim owes its present popularity in no small measure to a generally increased prevalence of heart affections, there can be little doubt that its widespread reputation is essentially attributable to the intrinsic merits of its waters and to the balneological methods which have been evolved by observation and experience.

I trust, therefore, that a brief description of the springs themselves, their physiological action, and the indications for their use, will not be devoid of interest.

In Nauheim, three springs, containing from 2½ to 3½ per cent. of the chlorides of sodium, lithium and calcium, besides some iron, are available for bathing. Their most obvious attributes are their richness in free and semi-combined carbonic acid, their natural temperatures, which are respectively 29·5, 32·5 and 35 degrees Centigrade (*i.e.*, including decimals, 85, 90 and 95 degrees Fahrenheit), temperatures which at once suggest themselves as suitable for bathing.

From two of these springs three different types of bath are prepared, and from one of them two types, whose essential difference is a greater or less proportion of free carbonic acid gas ; for on the proportion of this gas, which can be

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graduated with exactitude, depends the potency of the water's physiological action.

The first and mildest type, the so-called *thermal baths*, contain least carbonic acid. They are obtained by admitting the water to large open reservoirs, where, in contact with atmospheric air, the free carbonic anhydride escapes, with a consequent precipitation of the calcium and iron salts which it held in solution. These salts colour the water yellowish-brown. With this bath we usually commence the treatment of cardiac cases.

To the second type, containing a little more carbonic acid, belong the *thermal-sprudel baths*, obtained by conducting the water to subterranean air-tight tanks, from which it is conveyed to bathing tubs. This water is clear, or slightly yellow, owing to its having lost but a proportion of its carbonic acid gas. These baths are of intermediate grade between the former and the effervescing baths.

The third, the effervescing type, are known as the *sprudel baths*. They contain the full amount of carbonic acid with which the springs issue from the earth. The water is conveyed by pipes directly to each tub without the intervention of tanks or atmospheric contact. These baths are strongly effervescing, bright, sparkling, and clear as crystal. The most potent effect is attained by immersing the patient in a continuous current of this carbonic-acid-laden water.

Clear brine baths, from which the carbon dioxide and the salts it holds in solution have been removed by percolation through brushwood, are also used at Nauheim. They contain some 3 per cent. of the chlorides, and are prescribed with some measure of success as an adjunctive treatment for rachitic, scrofulous and anæmic children. I do not propose to refer further to them in this paper.

Explanation of the *physiological action* of a Nauheim bath, or of a course of baths, would, I think, be facilitated by first observing the outward visible signs and symptoms, and then investigating their etiology.

On entering a Nauheim bath of natural temperature the following symptoms are observed. There is at the outset a

slight sense of shuddering, soon, however, to be succeeded by a general sensation of warmth. In their earlier immersions cardiac patients occasionally experience a feeling of thoracic oppression, which is, however, but transient, and which disappears entirely in succeeding baths. In a sprudel, or effervescing, bath the body is soon completely covered with countless bubbles of carbonic acid gas. After ten minutes' immersion the patient's temperature, taken *per rectum*, has fallen some two-tenths of a degree Centigrade. Five minutes more and a further fall of from one to two-tenths is not infrequently observed. Already, hyperæmia of the skin has supervened to a degree dependent on the amount of carbonic acid employed. On quitting the bath and rubbing down, the glow becomes more marked, and on examining the patient we now find the pulse stronger, fuller, and usually, though by no means invariably, slower. Blood-pressure is sometimes raised, sometimes reduced, a matter to which I shall presently refer. Respiration is easier, the patient feels refreshed, revivified, and has a general sense of warmth and *bien-être*.

The more delicate occasionally experience a sense of lassitude, especially after their earlier baths, and should a delicate patient be immersed at the outset in a basin containing a high proportion of the gas, such undesirable symptoms as excitement, fatigue and deterioration of the heart's action may ensue.

Directing our attention to the etiology of the changes produced by the baths, we find that they are attributable to the stimulation of the skin by means of the salts, the carbonic acid and the temperature of the water; and that the elements in the skin which respond to this irritation are the terminations of the cutaneous sensory nerves and the capillary vessels. Although our inferences as to the physiological action of the baths are to a certain extent based on hypothesis, it is of the utmost importance for a proper application of the waters to have as clear a conception of their effects as practical experience, combined with sound physiological consideration, can afford. It is therefore expedient to devote a little time to the explanation of this matter.

Let us first examine the influence of a bath's temperature

upon the body. Should the temperature be about two degrees Centigrade below blood-heat its influence, save as a detergent, is practically *nil*. We term this temperature—35° Centigrade (95° F.)—the "point of indifference." Should the water be warmer, the temperature of the body is increased, and a number of changes take place in the circulatory system which are usually undesirable, and to which I need not advert. These higher temperatures are not prescribed at Nauheim. We only employ those below and up to the "point of indifference," which the Nauheim waters naturally possess. In baths of the latter kind the body loses warmth, and as our system has the tendency, and in large measure the capacity, to maintain its normal temperature, the consequence is increased production of heat. It is known that increased exhalation of carbon dioxide corresponds to this. Coincidently there is increased excretion of urea, proving that the metabolism of nitrogenous matter is also accelerated. The most obvious physiological explanation of this improved metabolism is that the peripheral nerves convey their stimulus to the spinal cord and sympathetic centres by which it is controlled.

Next we notice changes in the circulation. On entering the bath there is acceleration of the pulse and contraction of the peripheral vessels of the skin and subcutaneous tissue. Internal congestion ensues. Soon, however, the contraction ceases, the superficial vessels dilate; the pulse becomes slower and stronger; "reaction" is manifest. This also is due to reflex action, the stimulus being conveyed to the pneumogastric nerve centres which, in their turn, control the heart.

Now, I emphasise the fact that although these changes occur in a carbonic acid bath of Nauheim which is but a few degrees below the temperature of indifference, they are not induced in the ordinary fresh-water bath, save at such low temperature as would throw an absolutely impermissible initial strain upon a debilitated heart. This, then, is the most remarkable feature of Nauheim baths, and it is essentially attributable to the salts which are held in solution and to the carbonic acid gas; for these ingredients, and more especially the latter, intensify the stimulation of the skin and modify the action of

the cold. The aggregate result is that in a Nauheim bath, reaction supervenes much sooner, and with greater intensity, than is possible with ordinary fresh water.

Although it is improbable that any of the salts in Nauheim water completely permeate the skin, it would appear that they are imbibed by the epidermis sufficiently to stimulate directly the peripheral nerve terminations and capillaries of the corium. Imbibed by the epidermis, the salts maintain their action for some time after the conclusion of the bath. The entire nutrition of the skin is thus increased, it holds a greater amount of blood, and its excretory functions exhibit a revivification which is more than transitory. From the spinal cord the epidermal stimulus is transmitted and diffused according to the laws of reflection and irradiation. Thus the entire nervous system and the many functions it controls, including the action and nutrition of the heart, are subservient to the stimulative action of these springs. Tissue metabolism is accelerated as in cold fresh-water baths, only more pronouncedly; and it is relevant to mention that researches as to the physiological action of chalybeate baths rich in carbonic acid, show that this gas chiefly promotes the metabolism of non-nitrogenous matter, while excreted urea is diminished relatively to its intake. Practically, this means that whilst our baths reduce superfluous fatty tissue, they facilitate the formation of healthy muscular substance. This, of course, is especially applicable to the effervescing sprudel baths. The acceleration in tissue metabolism, aided as it probably is by osmosis, promotes the absorption of exudations in the joints, pelvic and serous cavities. And Nauheim baths are among the most efficient means of abolishing the residues of rheumatism and gout, of serous inflammations, such as pleurisy and pericarditis, and of inflammatory conditions of the adnexa of the female genital organs.

The consummation of a course of treatment is comprised in improved assimilation and metabolism, with coincident formation of fresh muscular substance, more especially in the heart. There is a collateral reduction or disappearance of superfluous fatty tissues and inflammatory residues, with more

efficient elimination of the effete products of tissue change. Consequently, loss of weight at the very outset of the course is common. The ultimate result is a renovation and strengthening of the organism, which, however, may not fully manifest itself until some time after the conclusion of the treatment.

Since the large majority of our patients seek Nauheim in consequence of some affection of the heart or circulatory system, I would refer especially to this class of cases.

The effect of the mineral baths on the heart is composed of two factors, viz.: (1) the mechanical removal by the "reaction" of obstacles to the circulation at the surface, and (2) the reflex action on the heart and blood-vessels generated by peripheral stimulation of cutaneous nerves.

In order to conduce to clearer understanding of some complex and, I suggest, frequently confused circulatory conditions, I must briefly refer to the part played by the vessels in the distribution of the blood.

A fluid flowing in a tube exercises pressure on every part of its walls and would rise to a certain height in a vertical branch tube inserted in its side. Should the tube be elastic an expansion of its walls will correspond to the pressure on its sides, and should the power which produces the current suddenly cease, the elasticity of the walls will maintain the current for a while. The entire work of the heart is therefore —our arteries being resilient—not transformed directly into current, but a part is stored up as elastic energy in the arteries. The mean velocity of fluid flowing in a tube is directly proportional to the power maintaining the current and bears an inverse ratio to its sectional area. If, therefore, the tube be expanded, the power must be increased, or else diminished velocity and stasis will ensue. Further, we know that the chief circulatory resistance is met with in the capillaries and that the greater part of the propulsive power is required for overcoming this resistance. Increase the resistance by vascular contraction and then, in this case also, must the power maintaining the circulation be increased. Thus the normal tonus of the arteries represents an *optimum* for the work of the heart, and any deviation from it by arterial contraction or expansion

means increased expenditure of cardiac energy, leading, perhaps, to dilatation.

The capillary dilatation during the period of reaction in and after the baths removes the principal circulatory obstacle and thus relieves the heart. This, however, refers solely to the capillaries; and it is an erroneous acceptation, too frequently met with in current literature, that during reaction arterial dilatation also ensues. Such an occurrence could not, in the light of what has just been stated, be regarded as otherwise than disadvantageous. The preservation of normal arterial tonus is of paramount importance.

We are led to assume that in cases of arterio-dilatation, the powerful irritation of the skin by the ingredients of the water increases the tonus of the arteries by reflex action, whilst in the less frequent cases of vasomotor spasm the excessive contraction is solved; the result of the baths in either case being a tendency to re-establish the normal optimum. Observations as to the practical effect of the baths are in strict accordance with this theory, for palpation proves that the tension of the easily compressible pulse is better after the bath, and that the blood-pressure rises in cases where it was previously abnormally low; whereas, on the other hand, one observes decrease of blood-pressure and of arterial tension when both have been abnormally high. Now capillary dilatation cannot *per se* account for all this, for it takes place in those cases where the blood-pressure is raised; therefore, in cases where abnormally high blood-pressure is diminished by the baths, removal of arterial spasm must be accepted as the cause.

Concomitant with these vascular changes, the baths bring about, by reflex action, more vigorous contractions of the heart; the immediate result being more perfect emptying of the cardiac cavities. Thus is induced a gradual diminution of ventricular dilatation, progressing, with prolongation of the treatment, even to its entire removal.

Now the removal of dilatation is of paramount importance in all heart affections, for it follows from the laws of hydraulic pressure that the heart is over-strained proportionately to its

dilatation, viz., a power acting upon a fluid is distributed equally through the entire amount. If, therefore, the heart contains just so much blood as it ejects normally at each stroke, it will have only to do so much work as is necessary to press its entire contents into the vessels. But should it be dilated and contain more blood, it must do proportionately more work even to eject only the normal amount, the rest of its labour being wasted by virtue of the equal distribution of the pressure of the ventricular walls through the entire contents of the ventricles.

I have already stated that reaction sets in sooner and more perfectly in a Nauheim bath than with ordinary fresh water; and should its temperature be near the "point of indifference," reaction supervenes with rapidity. Such baths have almost solely a relieving influence on the heart. The lower the temperature the longer the period which precedes reaction; the cooler baths having therefore a preliminary stimulating effect which we utilise as an exercise for the heart. Thus by regulating the temperature and also the carbonic acid and saline constituents, we can achieve by these baths an exceedingly accurate dosage of relief or exercise for the heart, and the technical arrangements for effecting these gradations are of the most perfect type. I know of no other means by which relief and exercise for the heart can be for weeks administered with such refined exactitude. It is, however, here expedient to mention that we usually combine the treatment with medico-mechanical gymnastics, resistance exercise and massage, to which I do not intend to refer here; only I may mention that I have recently been investigating the influence of the sinusoidal alternating electrical current applied in ordinary fresh-water baths, and have found marked effects on the tension of the arteries, on blood-pressure and cardiac dilatation: I therefore use this type of electrical application at Nauheim in cases which seem to suggest it.

Now in selecting cases for Nauheim, it is important to bear in mind that less depends upon the cause of the disturbed circulation than upon its grade. The baths are equally indicated in valvular lesions, in muscular weakness with dilata-

tion, in arterio-sclerosis and in nervous heart complaints, so long as the affection is not too far advanced, and so long as the heart possesses that necessary amount of reserve energy through whose stimulation the power necessary for maintaining the circulation can be restored.

Competent observers assure us that they have seen the valvular lesions of recent rheumatic fever disappear through a course of the baths. Even if we do not consider this to be absolutely proved, knowing, as we do, that in acute rheumatism murmurs frequently occur without valvular lesions, we cannot deny the possibility of an inflammatory exudation in the valves (which is the first stage of a lesion) being absorbed under the influence of the baths. Therefore patients in whom suspicious cardiac signs succeed an attack are suitable cases for Nauheim.

Should patients with valvular defects take baths as a prophylactic while in a perfect state of compensation? If we consider that the over-filling of the cavities and consequent cardiac dilatation are the features which cause the final breakdown, and if further we recall to memory the physiological action of carbonic acid salt baths in reducing dilatation and enabling the heart to empty itself more thoroughly, then I feel justified in answering this question in the affirmative. I have seen very favourable effects in such patients, especially in cases of high blood-pressure, where the dilatation underwent a reduction of from one to two inches.

Further, Nauheim is suitable for the earlier stages of broken compensation with slight dyspnœa during rest, or only on exercise slight œdema of the ankles and a smaller degree of hepatic congestion. In the medium stages of incompensation, with marked dyspnœa during rest, œdemata and albuminuria, the results cannot be foretold with certainty. Much depends on the patient's age, and certain it is that in such cases digitalis gives better results with the baths than without them. For the more advanced stages with marked ascites and anasarca Nauheim is of no avail.

Especially favourable for Nauheim are simple muscular weakness and the earlier stages of dilatation, such as so commonly supervenes on influenza, enteric fever and acute

rheumatism, and is so frequently attributable to alcoholic excess, over-exertion, anæmia and chlorosis.

Cor adiposum, as accompanying general obesity, is, as a rule, favourably influenced by baths, gymnastics, massage and dietetic regulations, including the use of drinking waters. *Pari passu* with diminished dilatation we observe increased muscular vigour and loss of weight.

As regards arterio-sclerosis, it seems plausible to assume that the resolving action of the mineral baths may have a favourable influence in incipient stages on the process itself. Such early diagnosis is, however, difficult, and usually the patients come to Nauheim when such consequences as cardiac weakness and angina pectoris have begun to manifest themselves. In not too advanced stages the action of the baths is often very favourable. Patients feel considerable relief and the angina frequently vanishes, the effect being doubtless chiefly attributable to the removal of peripheral circulatory resistance. As a class these cases require more than ordinary precaution in graduating the degree of effervescence. In the later stages of arterio-sclerosis Nauheim is contraindicated.

Thus, guided by our physiological knowledge and practical experience, I trust we can select those cases most suitable for Nauheim's baths, and exclude the rest, thereby bringing relief and even cure to many, and avoiding disappointment for all others.

THE AIX-LA-CHAPELLE TREATMENT OF SYPHILIS.

BY DR. LIEVEN (AIX-LA-CHAPPELLE).*

THE time has gone by in which people thought that this or that medicinal water alone could cure syphilis. Nevertheless, the thermal springs of Aix-la-Chapelle are still regarded as an essential factor in the treatment by inunction which has rendered the place famous. The value of the waters consists chiefly in the fact that they facilitate the use of mercury, which, according to our present views, is the only weapon for the complete eradication of syphilis. In spite of the fact that the curative powers of the metal have been abundantly demonstrated from time immemorial, repeated attempts have been made to supplant mercury by other drugs. This was no doubt due to the fashion that obtained of administering the drug in great excess, thus subjecting the patient to grave dangers.

The production of symptoms of intoxication which were formerly considered necessary for the success of mercurial treatment, with all their torturing accompaniments, have left a deep impression on laymen as well as doctors. Prominent among these were serious ulcerative stomatitis with the subsequent formation of cicatrices in the mouth, mercurial tremors, and above all, the mercurial cachexia, the last-named being, of course, the result of the terrible salivation which was always deemed necessary. It may be said that this impression has even yet not been entirely overcome, and that on account of the memories that still linger the words of the anti-mercurialists still gain the ear of the masses, in spite of the fact that at the present day we know that mercury can be, and constantly is, successfully administered without in the slightest degree injuring the organism.

That syphilis could be cured without having recourse to methods causing symptoms of poisoning is a doctrine that has

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been preached for centuries by discerning physicians, but it has been reserved for a more modern period and is due more especially to the influence of Ricord and Sigmund that this opinion has gained universal recognition. It is Aix-la-Chapelle, however, which claims the credit of having justified this assertion by means of the inunction cures—as humane as they are successful—which are carried out at the springs.

I have purposely spoken first of the treatment of syphilis by means of mercury, because I desire to emphasise the fact that all the practical knowledge of modern times goes to prove that in mercury we possess the only real specific for eradicating the virus. My own experience quite coincides with this view, which is further borne out by Jadessohn's statistics "on the course of syphilis in prostitutes," as well as by the difference in the course of syphilis to be observed in those countries where "on one hand there is copious and methodical exhibition of mercury, and on the other hand insufficient treatment of the syphilis."

Mercury differs materially from other antisyphilitic drugs, especially iodide of potassium, inasmuch as all stages of syphilis are favourably influenced thereby. The tertiary as well as the secondary forms may be cured by Hg. Above all, it is acknowledged that the heredity of the syphilitic virus can be influenced by mercury but not by iodide. The longer I practise the more is the connection between tertiarism and neglected mercurial treatment forced upon me. I always hear the same story repeated by seriously affected tertiary patients, and more especially by those suffering with diseases of the brain and spinal cord, namely, that their case at the commencement had been exceedingly slight and that the doctor had in consequence deemed that one small cure only was necessary. This is especially noticeable in the cases of tabes dorsalis of a specific character which come to us for treatment in great numbers.

Although I regard mercury as the one actually permanent and effective treatment for lues, I would not, therefore, dispense with the other drugs used at the present day, namely, the iodides and sarsaparilla; the former (for the introduction

of which we are indebted to your great fellow-countryman Wallace) is of the greatest service to us at Aix-la-Chapelle. It must be admitted, however, that it is only during the last few decades that we have fully learned to appreciate its value.

We do not regard the iodide as an actual antisyphilitic remedy; one, that is, which is capable of permanently destroying the virus; but we always use it where the object is to ensure an absorbent effect on syphilitic neoplasms, such as the proliferating inflammations and the periostal swellings of the initial stage, and especially all the localised gummatous processes of the later stages. In this sense sarsaparilla is also effective in certain special cases, but to this I shall refer later on.

I shall first discuss the method of administering the mercury which is now in vogue at Aix, and I shall then describe the means which in certain special cases we employ in conjunction therewith.

As in other chronic diseases, so in syphilis, the efforts of the physician, where this is possible, are directed to combating the disease during the period of its early development, so as not to permit it arriving at the dreaded tertiary stage. For this reason it is customary to concentrate as much treatment as possible into the first years, or even months, of the existence of the disease. One endeavours to prevent any new outbreak of the ailment by long-continued administration of mercury. In England, and to some extent in France, it is usual to give patients mercury *per os* for a long time. This method of administration is not regarded by us as satisfactory, partly because we do not consider the effect to be sufficiently energetic, and largely on account of the intestinal complications which this form of treatment is so liable to induce. That stomatitis is not always the evidence of severe general mercurialism is demonstrated by the fact that patients come to me exhibiting recent syphilitic lesions on the skin side by side with their stomatitis. On employing the baths and the cure by inunction the mouth symptoms subside, and simultaneously the eruptions on the skin and mucous membranes

tend to disappear. The urine in these cases, nevertheless, exhibits a much larger quantity of mercury than had been the case during the treatment by pills, showing that it was not the drug which was at fault, but the method of its administration.

The second method which, on theoretical grounds, appears to possess particular advantages, is that by hypodermic injection. We give injections of the soluble salts of mercury daily, or we implant a dose of some insoluble salt into the muscles of the nates once or twice a week. The latter is done in the hope that the metal will be evenly and regularly absorbed. The particular advantage of this process is that we know that the mercury is being completely taken into the body, and that thus the excretion of unused variable quantities of mercury, such as is necessarily the case in the pill cure, is impossible. The disadvantage of the injection method is that we are not in a position to stop the effects of the preparation once it has been injected. Where soluble salts are used this is not so serious, but the insoluble preparations suspended in paraffin or oil are occasionally a long time before they are taken into the system, and may then give rise to trouble. Cases have come to our knowledge in which such deposits have lain for months unaltered in the glutea, and have then suddenly passed into the circulation, giving rise to serious toxic symptoms. In this method, too, there is always the possibility of the injection being introduced into a vein and thus causing embolism in the lung. In this respect "grey oil" and calomel are particularly dangerous. Hydrargyrum salycilicum, on the other hand, is a very reliable salt. It is the one which I generally use when employing the injection method.

It is right, however, to say that injections of comparatively insoluble salts have this advantage, that in order to bring the body thoroughly under the effects of the mercury, they need only be used at intervals of several days. As the result of a course of this kind of from six to eight weeks' duration one is able to demonstrate large quantities of mercury in the urine for months after, and the therapeutic results of this long retention of the metal in the body are perfectly satisfactory.

Nevertheless, the inunction cure as practised at Aix-la-Chapelle is of a higher value and is more permanent in its effects than any other method. Inunction is the method almost exclusively employed there, so long as there are no stringent reasons to contraindicate it. In the administration *per os* the intestinal tract becomes the medium of distribution of the drug; in the cure by injection the absorptive power of the muscular system is utilised. In the treatment by inunction the skin becomes the organ for its introduction into the system.

As it is a well-known fact that mercury will not penetrate through the uninjured skin, but only attains the sebaceous and sweat glands and the hair follicles, whence a sort of diffusion of the vapourised metal in the lymphatic circulation takes place, we attach particular value to the thorough preparation of the skin prior to the inunction and to the thorough rubbing of the ointment into the natural cuticular pockets. The preparation is accomplished by means of the thermal baths. Their alkali softens the epidermis and, by mechanical removal of the effete scales, causes the orifices of the glands to dilate more widely, thus facilitating the penetration of the ointment. The pressure of the water in the bath and the rise of the temperature of the skin during its administration doubtless assist in the process of diffusion. The inunction itself is performed by a certificated "frotteur" who, by means of a moderate pressure, massages the prescribed quantity of the unguentum cinereum into the skin for about twenty minutes. It may be incidentally mentioned that these "frotteurs" pursue their calling for many years (one of them worked for Dr. Brandis for thirty years, and has been working for me for the last ten years) without any injury to their health. Numerous analyses of their urine have from time to time been undertaken during the season, when they have to perform thirteen to fifteen inunctions per day, and the tests yielded the surprising results that the urine contained only $\frac{1}{3}$ to $\frac{1}{5}$ of the quantity of mercury which is exhibited by most of the patients after twenty inunctions. This also speaks against the view that the inhalation of the mercurial vapour represents any important factor in the results which we attribute to the inunction treatment.

The mercury, on reaching the interior of the body through the skin, is distributed to all the organs in the form of mercurial albuminate. This indicates anew the necessity for providing the opportunity for brisk metabolism, as through the energetic disintegration of albumen the metal is always being released from its conjunction with the albumen to be again rapidly subjected to a similar combination. We endeavour to assist this metabolic process by means of the water cure; that is, thermal baths, douche-massages, vapour baths and electric baths. These procedures considerably increase the excretion of the mercury by the urine, and we know that an increased output means that there has been an increased assimilation.

Notwithstanding the introduction of mercury into the body in such large quantities, the effect of the metal on the mucous membrane of the mouth is usually trifling. I attribute this to the effect of the hygienic preventive measures on which we insist, especially to the continual careful disinfection of the mouth with tooth-paste and mouth-wash, on which we lay great stress.

Mercurial stomatitis is caused by a necrosis of the epithelium, and except where there is an idiosyncrasy, it only becomes a severe affection when the denuded parts are contaminated by bacterial infection. One may imagine that the effect of the mercury on the intestine is very similar. The intestinal epithelium becomes necrosed by means of the fæces containing mercury, an event which may easily occur when there is chronic constipation, so that the mercury which is to be passed with the excrement has the opportunity of acting on the intestine for a long time. For this reason it is always wise to see that the bowels are moved daily during the cure.

Having thus given you a rough outline of the general principles of the Aix-la-Chapelle inunction cure, I will now proceed to describe the ordinary method of procedure. Every morning the patients drink two or three glasses of the spring water, each glass containing 200 gr. Should he suffer from sluggishness of the bowels, I have the first glass strengthened with a teaspoonful of Aix-la-Chapelle salts. This is a pre-

paration made by the Society of "Aix-la-Chapelle natural spring products," which, like Carlsbad salts, is produced by evaporation of the water. It is only in obstinate cases that I order Carlsbad salts to be taken in the same way. Mostly, however, the simple Aix-la-Chapelle spring water is sufficient to induce the daily stool. The Aix-la-Chapelle spring water has also a favourable effect on the condition of the intestinal tract, inasmuch as the alkaline salts in the intestines are for the most part converted into sulphuretted hydrogen, causing the mercury excreted with the fæces to be transformed into the comparatively harmless black sulphide of mercury. Moreover, careful examinations have shown that the assimilation, and consequently the excretion, of mercury is markedly increased by imbibing the water (Beissel). After the patient has taken his quantity of water (which he does slowly) he is given a thermal bath. Weak patients, more especially those with affections of the central nervous system, must only bathe in water in a temperature of about 92 to 94° F., whereas strong persons can easily endure baths up to 97 to 98° F. The duration of the bath averages from five to twenty minutes, according to the state of the patient. I have already mentioned the effects of some of these baths. In addition to those already noticed, we must remember that, by means of its saline constituents, the bath stimulates the cutaneous circulation and thereby assists the absorption of the mercury. Every day that portion of the body which after the bath is to be the seat of the rubbing is thoroughly washed with soap to prepare it for the reception of the ointment. The remaining parts of the body, if they are already covered with the ointment, are not soaped; in fact, the patient is directed to be careful not to remove the mercury already smeared on to his skin, and to avoid friction with the towel when drying himself. Drying the body is accomplished by gentle dabbing only. Experience has taught us that in this manner the ointment is not removed either during bathing or drying. The melting point of unguentum cinereum is 113° F., so that the bath of 95° to 97° F. cannot liquefy it. Occasionally the balneary treatment is rendered more efficacious by ordering a vapour bath or a douche-

massage. These procedures are followed by the usual thermal bath by an interval of fifteen to twenty minutes.

After the bath the patient rests on his bed. He is conveyed by a lift from the bath-room to his apartment, which is situated in the same house. We try to avoid perspiration as much as possible, as experience has taught us that this is weakening. The patient then takes his breakfast, and about an hour subsequently he receives his inunction. For this inunction, which is always performed by a certificated masseur, we use the 33 per cent. grey ointment (unguentum neapolitanicum) which is hand-rubbed into the skin regularly, evenly, and, I may say, almost mechanically, for twenty minutes. In the case of very hairy persons the skin is previously shaved in order to prevent inflammation of the hair follicles. For the massage the soft parts are preferred, and all pressure on the bones is carefully avoided. The soles of the feet are not treated because the corneal layer is too thick to allow of absorption. The region of the axilla and the skin between the scrotum and the thigh also remain untouched, as eczema might easily be excited by slight irritation in these situations. The massage is performed on different parts in turns; thus on the first day the legs are rubbed; on the second, both thighs; on the third day, the back; on the fourth day, the abdomen and iliac regions; and on the fifth day, the arms. This sequence is always preserved. If one intends (as in threatening conditions) to produce a certain effect by large quantities of ointment, we do not apply a greater quantity of ointment on only one of the parts above mentioned, but we include a greater area of skin in the daily inunctions. For instance, if I desire that more than 5 grams be rubbed in, I always have the half of the part next in sequence included in the day's rubbing, thus: on the first day both legs and one thigh; on the next day the other thigh and the back, and so on.

Before the mid-day meal, as a rule, another glass of the spring water is taken. This generally has the effect of promoting appetite.

During the treatment the care of the mouth receives great

attention. The patient's teeth, which have been previously freed from tartar and sharp angles by the dentist, are cleaned after each meal with a soft badger-hair tooth-brush and a salol and chlorate of potash paste. In addition, the mouth every half hour is rinsed with a solution of aluminium aceticotartaricum. In order to be able to do this punctually the patient always carries the bottle of mouth-wash in his pocket. In the act of cleaning the teeth he is warned to be careful not to injure his mouth with the tooth-brush, as even slight abrasions are quickly transformed into ulcers. The region behind the wisdom tooth is particularly prone to ulcerations of a superficial character. This tooth in some persons does not pierce entirely through the mucous membrane, so that the posterior part of the masticating surface remains covered by a small lobule of gum. The latter, during mastication, is particularly liable to all sorts of injury, and then becomes peculiarly liable to ulceration. From this point, and under the influence of the mercury, the ulcerative process spreads to the cheek, and may even attack the palatine arch and the tonsils. The loosening of the teeth in their sockets is a well-known phenomenon. As a general rule the stomatitis which occurs during inunction treatment assumes a more acute character than that which we see in the protracted pill cure; in the latter the mucous membranes are frequently anæmic and purulent at the edges, causing the teeth to loosen more or less.

In the more acute affection which is peculiar to the cure by inunction the mucous membrane is generally dark red, and there is, as a rule, no loosening of the teeth, if the inflammation is immediately checked by suitable means. This consists chiefly in a thorough cauterisation of all the loose gums with concentrated chromic acid, which must be carefully applied every other day. Care must be taken not to touch healthy parts with the acid. The results as a rule are immediate and in a few days normal conditions will again prevail. In less severe inflammation it will be found sufficient to pencil the gums once daily for two or three days with a 10 per cent. solution of nitrate of silver.

Such affections of the mouth, however, occur only in patients who have not carried out the above-mentioned preventive measures with sufficient care, and it is not then necessary to interrupt the treatment by inunction. In most patients, notwithstanding that the treatment is continued, there is no sign of renewed stomatitis. Warned by one attack he directs increased attention to the care of his mouth and the ventilation of his room. "A burned child fears the fire."

On the other hand, should the stomatitis be attributable to an idiosyncrasy on the part of the patient, it is not uncommon to find *enteritis mercurialis* set up simultaneously, in which case, of course, it is necessary to interrupt the treatment for a few days until the mouth and intestine again exhibit normal conditions. I then make it a rule to recommence with a third of the amount of the ointment previously used, and slowly to increase the quantity, so that in about a week the original amount has again been reached. In most of the cases this is followed by satisfactory results.

During the cure it is highly expedient that the patient should guard against all errors of diet. Especially should he avoid all foods that are capable of giving rise to fermentation. The diet should be as supporting as possible. I try to induce the patients to drink a great deal of milk, and I permit those who are used to alcohol to take a small quantity of it, freely diluted. Red wine with seltzer water is the most suitable beverage for meals. I am particularly careful in regard to smoking, especially during the secondary period. There is no doubt that tobacco (like concentrated alcohol) has a directly provocative influence on the origin of plaques on the mucous membrane of the mouth and throat. I have learned from experience that most ladies, as a rule, are less liable to suffer from pharyngo-oral syphilis than men. Russian women, on the other hand, who are in the habit of smoking cigarettes all day long, are a notable exception; their predisposition is not at all different from that of their male fellow-sufferers.

During the treatment by inunction we direct special attention to the condition of the urine. Frequent examinations for albumen afford opportunities for discovering if the kidneys

are implicated in the disease. Any decided reaction to albumen demands a pause in the treatment. The albuminous constituents then usually rapidly disappear from the urine.

So much, then, for the details of an ordinary course of inunction which, as I have already explained, we employ in all stages of the disease. There are, however, certain supplementary means which we sometimes find necessary, and to these I will now direct attention. Not infrequently we make a liberal use of the iodide preparations. The iodides are, in the rapidity of their effects, superior to Hg. during the tertiary stage, and we give them in the form of iodide of potassium, in large doses by the mouth, as soon as any symptoms of a gummatous character present themselves, as for instance, in threatened perforation of the palate. In these cases I give about 75 to 100 grains of the salt well diluted with milk or soda water. As soon as a tendency to heal has set in, or the gummata retrogress, or red granulations appear in the base of the ulcers, iodide is no longer necessary. Nevertheless, to make sure, and to maintain the influence of the drug, I am in the habit of giving injections of iodipin, which is a 25 per cent. solution of iodine in sesamoid oil. The advantage of such injections is, that with them as with treatment by inunction, and the injection of insoluble mercurial salts, a very protracted action can be ensured. I have in fact found that, six months after injections of a total of about 200 grs. of iodipin, the urine still gave a distinct iodine reaction. In this respect iodipin is superior to the iodide of potassium, because the latter is completely discharged from the organism in a day or two. I therefore inject 10 to 15 syringefuls, each containing 15 gr. of 25 per cent. iodipin, at definite intervals into the nates, whenever any relapse of tertiary symptoms is to be feared.

The hypodermics are borne remarkably well, and in spite of the larger quantities injected, they do not cause anything like so much local disturbance as the majority of the mercurial salts. Symptoms of iodism, such as coryza, headaches, or acne, are hardly ever seen as the results of this method. It appears, moreover, that iodipin possesses the property of

considerably increasing the tolerance for the mercurial inunction, which is continued simultaneously.

A third remedy which I employ incidentally is sarsaparilla. This I give in cases where former excessive mercurial treatment has acclimatised the body, and the treatment therefore lacks the prompt response which we are accustomed to expect. Cases of tolerance of mercury are common among those affected with the so-called syphiliphobia, that is, people who are continually taking the drug in anticipation of a relapse. Sarsaparilla has a special effect on the secondary and tertiary manifestations in the mucous membrane of the mouth and throat, which so frequently tend to recur. It may also be given with advantage after a course of inunction when considerable scar formation with contractions have set in. It tends to prevent undue shrinking.

I have succeeded during the last few years in having the active principles isolated according to Professor Kobert's suggestion. By this means we are now in a position to administer the concentrated remedy in doses of two teaspoonfuls daily, instead of the large quantities of the decoction hitherto in use. In this preparation the purgative action of the decoction is preserved without giving rise to the stomachic disturbance which is so common an accompaniment of the drug in its orthodox form.

Such are the ordinary methods of treatment at Aix-la-Chapelle. We have, however, very occasionally to do with cases in which the inunction *régime* is inadmissible, and we are consequently obliged to find substitutes.

I have already said that an essential for the cure by inunction is a skin which is in a condition to absorb the mercury. All those cases, therefore, in which there are such alterations of the cuticle as to render the introduction of mercury impossible, are necessarily unsuitable for the treatment. Speaking generally, treatment by inunction is unsuitable to those who have skin affections which cause a thickening of the epidermis. Such are lichen and extensive psoriasis. Moreover, there are patients whose skins are peculiarly sensitive to mercury, so that the first inunction causes an extensive

rash with subsequent desquamation. This sensitiveness may be so pronounced as to put any question of treatment by inunction out of court.

Finally, there is a condition that cannot be termed pathological, but which nevertheless makes the practice of inunction impossible. There are some patients with apparently sound and healthy skins, in whom it is nevertheless quite impossible to get mercury into the system by way of the skin. I have met with two such cases. On undertaking the quantitative examination of the urine, which as a rule I do after fifteen inunctions, I found that there was absolutely no trace of mercury in the urine. In these cases of impermeability, or hypersensitiveness of the skin, I usually replace treatment by inunction by injections of hydrargyrum salicylicum, the method being to inject $\frac{1}{2}$ ccm. in oil emulsion twice weekly. The "cure" in this way takes six weeks as a rule. Treatment by baths and drinking waters are practised as in the cure by inunction. I regard this method of treatment only as a makeshift, however. Nothing can compare with the inunction method for certainty of results.

Having now given a description of the methods we employ, I should like to add a few words as to the period when the patient should begin his treatment, and on the important question as to how often a course should be repeated before recovery can be considered assured. First of all let me sound a note of warning against the commencement of general treatment of syphilis before the second stage has set in. Even prominent authorities may occasionally make an error in the diagnosis as to whether a hard or soft chancre is present, and if the patient has been treated with mercury before the appearance of the roseola, the question of its having actually been syphilis or not will remain a doubtful one both to doctor and patient. Moreover, prominent syphilographers assert that the whole appearance of the disease is altered by commencing the treatment before the outbreak of secondary symptoms, and that as the result of such treatment the course of the secondary period becomes characterised by frequent and early relapses.

For this reason I recommend the local treatment of the

18

primary affection until the exanthem appears, and then, and not until then, the patient is allowed to commence his cure by inunction. Of course exceptions to this rule may be absolutely necessary, as for instance when the primary affection is situated extra-genitally, such as on the lips or on the face, a state of matter which constitutes a danger to the patient's surroundings, especially when he lives at home, and prompt precautions must, of course, be taken. If the primary affection were of an excessive size, or showed any signs of gangrene, immediate general treatment would be equally necessary.

I am of opinion that the diagnosis of repeated so-called re-infections with syphilis would be made far less frequently if more attention were directed to every primary sore. I am convinced that a second infection with syphilis is of very rare occurrence and that most of the so-called cases of re-infection are based upon a mistaken diagnosis of the first local lesion.

After the termination of the first course, lasting about six weeks, I advise that the mouth wash be continued for another three weeks, for, as I have several times observed, the effect of the mercury absorbed into the system by inunction is maintained for a considerable time, and is thus capable of giving rise to a late stomatitis. Three subsequent courses are then taken at intervals of six months.

If, at the end of a year, after the third course, no relapse should occur, the next course may be postponed for another twelve months. After one such additional course the cure is generally complete.

It is very seldom that we give Hg. in the intervals between the courses, because the results of the single half-yearly so-called "principal courses" are then all the more energetic. Should, however, relapses occur in the interval, more especially in the way of affections of the mucous membrane of the mouth and throat, my advice is to try so far as possible, to combat these by means of local treatment. This is assisted by the Hg. which is still in the system, so that the desired results are easily attained. I recommend thorough, but careful pencilling of the plaques in the mouth and throat with

60 to 80 per cent. chromic acid and subsequent touching of the scabs with Boeck's lapis. This forms an eschar of chromate of silver which clings remarkably firmly. If the interval between the appearance of the relapse and the next principal course is a very long one, in cases where the plaques do not yield to local treatment, or where slight symptoms appear on the skin, I usually give a pill containing 1½ grains hydrargyrum oxydulatum tannicum, with a little extractum opii three times daily for three or four weeks.

I only deviate from this plan of action in cases which betray early signs of malignant character, and threaten to lead rapidly to tertiary symptoms. Then, according to the individuality of the case, I employ treatment by inunction at short intervals. In such exceptional cases I also administer iodide of potassium or iodipin, even during the first year, whereas in cases running the normal course I reserve the iodide for the second year.

Most of the patients coming to Aix-la-Chapelle are in an advanced stage of syphilis. Many have not been subjected to immediate treatment, or have been treated without satisfactory results. We see many cases of syphilis of the bones and of the central nervous system. In regard to such cases it is of course impossible to make any general statement as to the probable duration of the necessary course, except that anything less than five or six weeks is absolutely useless. In tertiary syphilis of the skin, of the bones, and of the internal organs, one to two courses usually suffice; in syphilis of the brain and of the spinal column, on the other hand, a larger number of courses are invariably necessary.

There are always a great number of patients who for various reasons either cannot go to Aix-la-Chapelle at all, or who are unable to go as often as desirable. I always advise such patients to undergo the cure by inunction at home under strict medical supervision. If the patient, during the treatment, carefully observes the above-mentioned precautionary measures and can give up tobacco and alcohol, there is no objection to a course being undertaken at home, provided that the doctor thoroughly understands the signs of danger and the methods of combating complications.

Such home courses may be advantageously supplemented by the use of the products of condensation of the Aix-la-Chapelle waters, which are prepared by evaporating the water in a vacuum apparatus. By this method salts containing all the solid constituents of the thermal waters can be prepared for use, as Aix-la-Chapelle saline baths and drinks, the chemical composition of which is as nearly as possible that of the natural springs of Aix-la-Chapelle itself. There can be no doubt that the use of this preparation in a home course, minimises very perceptibly the danger of acute mercurial poisoning.

Some things, certainly, cannot be accomplished in one's own home, and a cure undertaken under these conditions is always inferior to one undergone at the fountain-head. First of all through want of a masseur, or in order to preserve his secret, the patient has frequently to undertake his own inunction. Though this may appear to be very easy, yet experience teaches us that few patients possess neither the energy nor the physical strength to rub regularly, evenly and firmly for a sufficiently long time. Moreover, when obliged to take the cure at home, the patients are liable to those petty domestic worries and business anxieties, complete freedom from which we regard as so important an element in the attainment of satisfactory results. Then, again, there is liable to be a want of method. To-day, perhaps, he will perform the inunction in the morning, to-morrow it will be delayed until bed-time ; frequently some excuse will arise for him to neglect the rinsing of the mouth at those half-hourly intervals which we have seen to be so desirable, and so on. All these and similar omissions are capable of seriously prejudicing the total effect of the treatment, to the success of which minute attention to details is all-important.

Quite a number of patients have told me what a benefit it has been to them to be relieved of the everlasting secrecy and the necessity for the concealment of their real condition ; and the fact that at Aix they find so many fellow-conspirators to whom they may speak freely is, of itself, a great compensation for the expenditure of the time and money necessary for a cure.

With a few not well-to-do patients a compromise from the full number of courses may be arrived at, that is to say, the first course is taken at Aix, and such subsequent courses as are considered necessary are taken at home.

The insight into the details of the treatment which a patient obtains at Aix, and the discipline he learns in attention to those details, are of the utmost value to any one who finds it necessary to take a course at home. I have endeavoured to give you some idea of what the details are, but to understand them fully you should come and study them on the spot.

A NOTE ON THE TREATMENT OF NEURASTHENIA AND OBESITY BY THE HIGH FREQUENCY CURRENT.

BY P. A. NIGHTINGALE, M.D.EDIN.

THOUGH the therapeutic value of electrical currents of high frequency and high potential is daily becoming more recognised, there is comparatively so little literature published in this country on the subject that one may be forgiven for drawing attention to two classes of cases which seem specially susceptible to its influence.

That cases of neurasthenia and obesity are steadily on the increase can hardly be doubted, any more than that their treatment is often most unsatisfactory, necessitating as it usually does the carrying out of an elaborate "rest cure" on the one hand, and the visiting of an expensive mineral spa on the other. Added to this, the true neurasthenic has often lost faith in medicines and refuses to try them any more, while declaring that it is impossible to be careful of his diet; in short, rapidly becomes one of those unfortunate individuals who falls an easy prey to the numerous unscrupulous charlatans who fatten on the land with their extensively advertised magnetic, colour, faith and other "cures" of all sorts. Yet it is precisely these very cases that often react quickly to the high frequency current, so that a complete cure may be effected, or at least very considerable relief given, within a comparatively short space of time and at a minimum of cost and inconvenience.

Before quoting a few typical cases it is perhaps hardly necessary to say that the dosage of the current, and its application by general or local methods, must be as carefully regulated as the administration of any drug to each individual case, and that no general rules can be laid down as to the duration of each session or the number of milliampères used.

CASE 1.—E. H., aged 31, complained of increasing deafness during the last twelve months, with transient loss of

memory, occipital headaches, general feeling of depression, and such inability to concentrate his mind on his office work that he was constantly going on sick leave, and had lost 9 lbs. in as many months.

On examination he was found to be of a highly nervous temperament, patellar reflexes exaggerated, pupils dilated and sluggish, rapid pulse, urine normal though of low specific gravity, various organs sound, moderate smoker, careful liver, weight 9 st. Between December 12 and January 18 he had thirteen applications of the high frequency current; by the latter date he had completely lost the headaches and depression, said his memory was normal and the hearing much improved, while his weight had gone up to 9 st. 8½ lbs. Seen two months later he was still in excellent health and weighed 9 st. 9½ lbs. During the treatment he never missed a day from his office.

His progress with regard to his weight I noted thus:—

Date.		*Weight before Treatment.* ST.	LBS.	*Weight after Treatment.* ST.	LBS.
December	12	9	0	8	13½
,,	14	9	1¼	9	1¼
,,	16	9	2	9	0½
,,	18	9	1½	9	1
,,	21	9	1½	9	0
,,	23	9	4½	9	3¾
January	1	9	4¼	9	3
,,	4	9	6¼	9	5
,,	6	9	6¾	9	5
,,	8	9	7	9	5¾
,,	10	9	6¾	9	6½
,,	15	9	7	9	6
,,	18	9	8½	9	7½

CASE 2.—B. W., aged 32, complained of general and increasing nervousness, insomnia, and steady loss of weight during the last six months, amounting to about 8 lbs. There was no organic disease; weight 11 st. 1¼ lbs. Treatment was begun on December 20 and continued till January 20, by which time he weighed 11 st. 1½ lbs., and expressed himself as feeling perfectly well again.

As in the former case, after each session there was an immediate loss of weight varying from a ¼ to 1¼ lbs.

CASE 3.—S. B., aged 26, complained of intense and persistent headache (which had baffled all medicinal and dietetic

treatment), general depression, nervousness, &c. Organically sound; weight 11 st. 7 lbs. Treatment was begun on October 6 and was discontinued on October 29, as she was then quite well and weighed 11 st. 8¼ lbs.

Four months later, on a recurrence of the symptoms, the weight was found to be again 11 st. 7 lbs. Three sessions were sufficient to entirely get rid of the headache and to reduce the weight to 11 st. 2½ lbs.

CASE 4.—H. E., aged 18, complained of choreic movements of the muscles of the face, left hand and left foot of some seven years' intermittent duration. During November and December nine sessions were administered, when she was found to have completely lost all the nervous twitchings, to be less chlorotic, and altogether to be in better health than she had ever been before. Though there was the usual loss of weight after each session, at the end of the treatment it remained the same as at the beginning—8 st. 1 lb. Seen four months afterwards she was in excellent health.

Noting the loss of weight as the result of the current, I tried it in several cases of obesity with considerable success, and found that the loss after each session was more than maintained in the intervals, and thus by repeated administrations a reduction of from 7 to 12 lbs. could be effected in a month with perfect safety and without causing any inconvenience.

CONCLUSIONS.

(1) That the high frequency currents are of real value in certain cases of neurasthenia and obesity.

(2) That they act of themselves, though their action is greater and quicker when combined with medicinal and dietetic treatment.

(3) That after a session varying from six to fourteen minutes, with a current of from 200 to 500 milliampères, there is an immediate loss of weight varying from a ¼ to 2 lbs.

(4) That this loss of weight is greater in persons of neurotic temperament.

(5) That many neurasthenics regain their normal weight within a few weeks.

I wish to direct special attention to the *immediate* loss of weight which follows upon the exhibition of the current after even a very few minutes. Looking over the last 250 weights of which I have made a record, I find that in only three or four instances has there been no reduction, in all the others the immediate loss has varied from a ½ to 2 lbs. This reduction holds good in the three types of patients dealt with, namely, those normal in weight, those above and those below normal. The difference between them is that within a day or two the first type returns to his usual weight, the second remains the same or even suffers a further loss, while the third regains more than he originally lost, the tendency throughout being to return to the physiological normal. The figures quoted in Case 1 are a good illustration of the third type.

BRITISH BALNEOLOGICAL AND CLIMATOLOGICAL SOCIETY.

COPY OF MINUTES.

ORDINARY Meeting held at 20, Hanover Square, on Wednesday, March 3, 1904, at 5.30 p.m. The President, Dr. STREET (Westgate), in the Chair.

The minutes of the last meeting were read and confirmed.

The following candidates were elected Fellows of the Society :—

A. C. Shaw-Mackenzie, L.S.A., Overstrand, Cromer.
Thomas Vincent de Denne, M.R.C.S.Eng., L.R.C.P.Edin., Sidmouth.

The death of Sir Edward Sieveking, Honorary President of the Society, who had occupied that position from the foundation of the Society, and whose advice and assistance were of immense value in its early days, was reported. A vote of condolence with the family of Sir Edward was proposed by Dr. SNOW and seconded by Dr. BAGSHAWE.

Dr. LEONARD WILLIAMS introduced a discussion on "Obesity."

The following took part in the discussion : Drs. Mahomed, Parkes Weber, Jaffrey, Percy Lewis, Luff, Solly, Douglas Kerr.

The discussion was adjourned to the next meeting.

ORDINARY Meeting held at 20, Hanover Square, on Thursday, April 18, 1904. The President, Dr. ALFRED F. STREET (Westgate), in the Chair.

The minutes of the last meeting were read and confirmed.

The following were nominated for ballot at the next meeting :—

R. Allan Bennett, M.B.Lond., M.R.C.S., Saltburn-by-the-Sea.
David Walsh, M.D.Edin., L.R.C.P., L.R.C.S.Edin., 70A, Grosvenor Street, London, W.

Dr. WILLIAM BAIN (Harrogate) then re-opened the discussion on "Obesity."

The following took part in the ensuing discussion :—

Drs. Clippingdale, Morison, Bezly Thorne, Symes Thompson, Robert Barnes, Baynes, Nightingale, Sunderland, Groves (Carisbrooke), Leon (Southsea), Braithwaite (Buxton), and the President.

Dr. BAIN and Dr. LEONARD WILLIAMS replied.

Obituary.

SIR EDWARD HENRY SIEVEKING, M.D.EDIN., F.R.C.P.LOND.

First Honorary President of the British Balneological and Climatological Society.

THE Society has suffered a great loss by the death of Sir Edward Sieveking, its Honorary President, which occurred on February 24th, after a few days' illness, in his 87th year.

Sir Edward Henry Sieveking was born in London in 1816, and was a son of a merchant of the same name, himself a descendant of a family well known in Hamburg. The son was educated at University College and Edinburgh, graduated as M.D. of the Edinburgh University in 1841, and settled in London to practise, becoming a Fellow of the Royal College of Physicians in 1852. He early became attached to the staffs of St. Mary's Hospital and of the Lock Hospital, to both of which he was consulting physician at the time of his death. He was also for a time physician to the National Hospital for the Paralysed and Epileptic, and Physician in Ordinary to Her late Majesty Queen Victoria, as well as to His Majesty King Edward VII. when Prince of Wales, and was appointed Physician Extraordinary to His Majesty in 1901. In addition to his many hospital and official duties Dr. Sieveking was actively engaged in medical literature. He was for some years editor of the *Medico-Chirurgical Review*, and was himself a considerable author, chiefly upon subjects connected with the diseases of the nervous system, of which he had large experience at the National Hospital. In this connexion he was the inventor of the instrument known as the æsthesiometer, for determining the tactile sensitiveness of the skin in different regions of the body. Among his works may be mentioned "Croonian Lectures on Epilepsy, delivered before the Royal College of Physicians," and editions of "Romberg on Nervous Diseases" and of "Rokitansky's Pathological Anatomy," both prepared for the Sydenham Society. Dr. Sieveking received the honour of knighthood

in 1886, and he was a Knight of Grace of the Order of St. John of Jerusalem. He was also a member of many medical societies, in most of which he had held presidential or other honourable office, and he was an honorary LL.D. of Edinburgh. He married, in 1849, Jane, daughter of the late Mr. John Ray, J.P.

One of the senior Fellows of the Royal College of Physicians writes: "Sir Edward Sieveking belonged to a class of physicians which is fast passing away. He was not of the new school, nor did he exemplify many of the features of the older one. He was actively at work when Bright, Addison, Latham, Burrows, Watson, and Jenner were at their best, and his familiarity with Continental languages kept him abreast with the newest contributions to medical knowledge, in particular with those relating to nervous diseases and pathology in general which emanated from Germany. He translated Romberg's work on nervous diseases, and Rokitansky's second volume of pathological anatomy. He edited the *Medico-Chirurgical Review* for some years, and was the author of a work on epilepsy, and joint author with the late Dr. Handfield Jones of one on pathology. He was amongst the first to employ the laryngoscope in practice, and he was an authority on the subject of examinations for life assurance, and wrote an excellent book upon it. His work and accomplishments attracted the attention and interest of Sir James Clark, which led to his appointment as one of the physicians in ordinary to the present Queen, when she first came to this country, and this secured for him a large addition to his practice. With Sir David Brewster, Dr. Charles Murchison, and a few others, he founded the Edinburgh University Club in London, and took ever after a deep interest in its welfare. He had always high ideals, and a keen sense of professional honour and dignity. Careful, punctilious, and precise, he exacted the same qualities from all associated with him. He held many offices in the Royal College of Physicians, and was one of the first Vice-Presidents elected when that position was established for a few years. He delivered the Croonian Lectures on the 'Localisation of Disease,' in 1866, and the

Harveian Oration in 1877. He drew attention to the manuscript of Harvey's Lectures of 1616, in which his discovery of the circulation is first mentioned, and this led to their publication by the college with an autotype of the manuscript. He had a long career at St. Mary's Hospital, and amongst his pupils are men now of high distinction in the profession. He was elected President of the Royal Medical and Chirurgical Society in 1888. He took an active part in the ambulance work of the Order of St. John of Jerusalem, which was highly appreciated, and was equally energetic in furthering the interests of Epsom College in its earlier days. Though never popular in an unworthy sense as a physician or a teacher, nor given to seeking popularity in any degree, he was a man of wide culture and reading, of great activity, whose aims and interests were lofty and for the public welfare. He retained his powers and a remarkably young aspect long after he had ceased to pursue the active practice of his profession."

This memoir of Sir Edward Sieveking should have a special interest for the Fellows of the British Balneological and Climatological Society, for it was he who in the Council of the Royal Medical and Chirurgical Society in the year 1889, first called attention to the advisability of preparing reports on the climates and baths of Great Britain. This led to the formation of the Sub-Committee of the Royal Medical and Chirurgical Society, which has since published the two excellent volumes so well known and appreciated by the profession. The stimulus to the consideration of the climates of this country, due to his initiative, led indirectly to the formation of the British Balneological and Climatological Society; and when in the year 1895 Dr. Samuel Hyde of Buxton, originated the idea of its foundation, Sir Edward consented to act as its Honorary President, and continued to hold that office until the day of his death. The advantage of his name, his encouragement and sympathy, and his advice on questions concerning the policy of the Society in its early days, were of immense value to the original Executive Fellows, and conduced materially to the success which has so far attended its administration.

Sir Edward was always ready to give advice on any subject of importance in connection with the Society, and as an outward and visible sign of his interest he presented to its library a few years ago all works on Balneology and Climatology which were in his possession. On many occasions he expressed his regret that his advanced age and infirmities prevented his taking a more active part in the work of the Society.

His funeral was attended by the President, Dr. Alfred Street, of Westgate, representing the Society, and a wreath of flowers was sent on behalf of the Fellows to express their sympathy with Lady Sieveking and his family.

Notes and News.

We are glad once more to call attention to the Voyages d'Etudes Medicales, which takes place this year from September 3 to the 15th. The stations to be visited are those in the centre of France and include the following: Néris, Evaux, La Bourboule, Le Mont-Dore, Saint-Nectaire, Royat, Chatel-Guyon, Vichy, Bourbon-l'Archambault, Bourbon-Lancy, Saint-Honoré and Pougues. The latest date on which names may be sent in is August 15, and all communications should be addressed to Dr. Carron de la Carrière, 2, Rue Lincoln, Paris. The price of the trip is £10. This includes everything (except what a person may wish to spend on souvenirs, &c.) from the place of rendezvous, Lamotte-Beuvron, on September 13, to Pougues, the place where the company is dismissed. Those coming from outside France can obtain a ticket at half price from the point at which they enter French territory to the place of rendezvous, and a ticket at half price from Pougues to the point at which they wish to leave French territory. The voyage this year includes, as may be seen, several places of the highest interest and importance, and it offers an excellent opportunity for those who are interested in balneological treatment, as carried out abroad, to make themselves acquainted with the details special to each station, and the novelties which progressive places like Vichy and Mont-Dore are constantly introducing. Judging from an experience gained in two similar voyages, we have every confidence in recommending this one to the notice of our readers. One of our experiences was gained at the time when the Boer War was in full swing, when consequently the English were not particularly popular in France, but however pronounced that unpopularity may have been amongst the ordinary classes, it certainly did not extend to medical men, for nothing could have exceeded the politeness and consideration extended to the foreigners, especially the English, on

that occasion. Having regard to the "e advice on any which now happily obtains, it is certain that the Society, and of the English this year will be no less cordial the presented was, and it is much to be hoped that many Fellowology and Society will take advantage of this opportunity. occa- and

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We are also asked to call attention to a course of holiday clinical instruction which is to be given in Paris from Monday, September 19, to Saturday, October 1, under the auspices of the Association of Medical Professional Teaching. These courses will take place at the Hotel des Sociétés Savantes, Rue Serpente, Paris. The scheme includes courses in Bacteriology by Dr. Veillon, in Dermatology by Dr. Leredde, in Massage by Dr. Marchais, in Diseases of the Urinary Organs by Dr. Noguès, in Electrotherapy by Zimmern, in Midwifery by Dr. Dubrisay, in Nervous Diseases by Dr. Sollier, in Applied Therapeutics by Landowski, in Hygiene and Therapeutics of Children by Dr. Lesné. Clinical instruction will be given in various hospitals as follows: In Practical Surgery by Dr. Souligoux (Lariboisière), in Gynæcology by Dr. Arrou (St. Antoine Hospital), in Auscultation by Dr. Caussade (Tenon), in Diseases of the Stomach by Dr. Soupault (Bichat), in Oto-rhino-laryngology by Dr. Laurens (Bichat), and in Ophthalmology by Dr. Morax (Lariboisière). The subscription for each course, which includes from about eight to ten lessons, has been fixed at twenty francs, to be paid in advance. The detailed programmes of each course, systematic and clinical, will be sent on application. All information can be obtained from Dr. Marchais, Hotel des Sociétés Savantes, Rue Serpente, Paris. The date of these courses appears to have been so fixed as to make it easy for those taking part in the Voyages d'Etudes Medicales to take advantage of them, the Voyages d'Etudes Medicales finishing on the 15th, and the courses commencing on the 19th.

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WEDNESDAY, MAY 18.

REMARKS ON BRITISH WINTER HEALTH RESORTS.

BY SIR DYCE DUCKWORTH, M.D., LL.D., F.R.C.P.
Physician to St. Bartholomew's Hospital.

A DECISION as to suitable health resorts during the winter months in this country is one which most physicians have to make in their practice. I propose to discuss this matter very briefly this evening, and to view it from a practical standpoint. Time was when this decision was mainly left to those who had the good fortune to have travelled widely in these islands, and were regarded, therefore, as experts in climatology at a period when railways were few, and means of locomotion very different from those of the present day. Now everybody travels everywhere, and the travelling public travels more and sees more of the world than many of us can afford to do. It thus comes about that people have discovered such climates and localities as best please themselves, and often betake themselves to health resorts without seeking any medical advice on the matter.

The essential features of an approved health resort have

been lately so well set before you by your President in his admirable opening address that there is little left to be added to his description. He is rendered familiar with almost all the desirable qualities by reason of his residence and experience, gathered on the Kentish coast, at a point where, though nothing is found to intervene between that locality and the North Pole, the climate is not Arctic in winter, but tempered by Gulf Stream influences, and secured from undue humidity by the absence of trees and much vegetation. He alluded to the bracing character of the air of this locality, and preferred to speak of the "briskness," or freshness, rather than of its coldness. When I hear the word bracing I am always reminded of a saying of Huxley, who declared that, in respect of elderly people seeking to be braced, there was little or nothing in the system, after the age of 60, left to be braced. But I have never agreed to that statement. I bear testimony to the remarkable qualities of the air in the locality just mentioned, and know nothing more remarkable than the sudden change of environment when removed from London to that atmosphere. It happened on one summer day that I had occasion to go from town to Brighton in the morning, and to Folkestone in the afternoon, and the difference in favour of the quality of the air at the latter place was very noteworthy, and made a strong impression upon me.

I am only concerned to discuss the question of British winter health resorts for real invalids, and not for the wealthy and healthy classes who proceed whither they will in order to avoid the disagreeable qualities of many parts of our climate in winter. I will only add that the latter part of the public do good service by establishing themselves in salubrious quarters, in that they secure a provision of good accommodation and ample supplies for any locality they favour, and also cause to be provided many of the amenities of life which render these localities more attractive than they probably would be were only delicate invalids to sojourn there. These idlers and frivolous people have their use, therefore, in these respects, but they are not always an unmixed benefit to these resorts.

It is certain that the factor of expense largely dominates

the question of locality for many invalids. Distance adds to the cost. The breaking up of a family and household adds still more to it, and otherwise enhances the difficulty of deciding where to go. The adoption of special sanatoria for phthisical patients helps to determine the matter for them in a way now generally favourable, for these are now established in many parts of the country, and generally are situated in localities found to be appropiate for their purpose.

The general tendency is, of course, to send invalids to the south, and as far as possible to secure sun, light, and warmth, and to avoid north and east winds. I suppose it will be conceded that no winter health resorts are to be found anywhere on the north-eastern coast of Britain, although the climate of parts of the eastern shores of Scotland is often genial and sunny till the end of November. On the western coast there are several resorts with favourable mild climate, modified by Gulf Stream influences and sheltered. The Scottish resorts suffer from too great rainfall. Grange-over-Sands, facing south, is amongst the best of those on the north-west coast of England. The Isle of Man has comparatively warm winters, but is hardly to be seriously recommended. Lytham, Llandudno, and Tenby are certainly available for several classes of patients. Falmouth ranks amongst the best of our English winter resorts, but is subject to a considerable rainfall and winds. St. Ives and Ilfracombe have the disadvantage of much exposure to wind, and the same may be said in respect of the warmer Scilly Isles. The other south Devonshire resorts are amongst the best we have, including Torquay, Dawlish and Sidmouth, all fairly sheltered from winds. Bournemouth, with its immediate suburbs, is certainly equal to these, the sandy soil and the pine-trees adding to its excellence. It has become rather overgrown and has now almost as many villas as it has trees. The undercliff of the Isle of Wight maintains its reputation, Ventnor, and Bonchurch affording many advantages of sun and shelter, especially for tuberculous and renal diseases. For convalescent patients we naturally think of such resorts as Worthing, Brighton, Eastbourne, and Folkestone, and for a winter

residence, Hastings and St. Leonards. St. Margaret's Bay has some advantage of sun and shelter from north and east winds. Ramsgate, Margate, and Westgate have their special qualities of pure free air and their remarkable restorative powers against scrofulous tendency and tuberculosis. Most of the Irish health resorts are rendered unsuitable in winter by reason of the constant rainfall and south-west winds, although in fine weather they are not to be surpassed. In the majority of the localities just mentioned, the climate, air and sunshine constitute the greatest possible change procurable for many invalids, and the greatest contrast to the climate of London or any large town. I regard the town climates of Great Britain in winter as amongst the most horrible in the world, owing to dulness, fog, negation of sunlight, and smoke-impregnated air. Their only advantages, beyond social amenities, as places of occupation and interest, are the warmth of the houses, the good drainage, the dryness, the benefits of good paving, and the abundant water supply. Recovery from acute illnesses is hardly possible in such places, and always retarded. To get out of them into any pure air and direct influence of light and sun is a boon for any invalid. It is grievous to realise that when urban dwellers are suffocating in fogs, mists and darkness in towns, people twenty miles away are often at the same time in full sunshine, and breathing with ease in a clean atmosphere. Any winds in towns are commonly converted into deadly draughts of air coming from all directions. Small wonder that vast benefits ensue when our patients are deported from these malign influences to a sweeter environment. Again, the quality of the air, even in the best months, in towns is far from satisfactory. The dust, smoke, swelter, and heavily-laden, hot air becomes insupportable, and constitutes a sordid medium between the fair sky and the exhaling roadway.

We may now consider the benefits which may be hoped for by resort to any of our British winter health resorts, and compare them with those which are attainable in other countries.

We have to consider the propriety of each particular locality for the particular individual we advise on this matter.

In this respect much depends upon the social position and tastes of the patient. Certain climates are best for certain maladies. Sea-side resorts are necessary and beneficial for some and harmful for others. Inland stations are requisite for some and less helpful to others. We should send the convalescent from acute disease in many cases to the sea; the gouty, the dyspeptic bilious invalids, and sufferers from skin diseases, to the higher or inland stations. Patients of the latter classes are apt to suffer in various ways when exposed to marine influences. Patients with chronic renal disease are found to derive benefit from warm sea air in sheltered situations. For such patients, and for those suffering from chronic bronchitis, asthma and emphysema, we have perhaps the greatest difficulty in finding in Britain appropriate winter climates. The worst factors in these islands are the frequent rainfalls, the humidity, the constant winds, and the absence of sun. All these entail a quality of environment which may be termed raw and depressing, especially for invalids. Each day of a British winter sojourn has therefore to be carefully watched, and its quality tested as to its fitness for an hour or two of outdoor life. Seldom are any two or three days alike anywhere in these latitudes, and the weather rarely assumes the character described by the French as *beau temps fixe*. Had we more regularly and frequently spells of continuous fine weather, many of our health resorts would be amongst the best in Europe. We recognise the efforts made in most of them to supply conveniences and agreeable amenities for invalids, many of them costly and beautiful. But as these places grow in size and popularity, they are apt to bring with them many of the counter-attractions of large towns, crowded hotels, increasing consumption of coal, tramway noise, so-called week-end visitors, and unwholesome and tempting distractions. These modern conveniences may be attractive enough to persons in fair health who have leisure, or to busy people who desire to spend a few days in them, but for delicate invalids who are sent there for months the case is very different. Such places may be appropriate for a summer holiday, though less suitable in the winter months.

I have myself the highest opinion of the winter climates of Westgate, Margate, Bournemouth, the New Forest, and the line of coast stretching from this on to Torquay and Falmouth. These are amongst the best for the majority of patients suffering from chronic ailments, and in fine weather they leave little to be desired. I do not feel satisfied as to the suitability of some of the sanatoria established for phthisical patients. The open-air treatment in many phases of the British winter must surely be very trying, and I cannot but believe that many of the health resorts and sanatoria in more sunny and genial climates are preferable, when they can be made use of. The winds, draughts, and chilly, damp air must be very trying to all the attendants who cannot be swathed in blankets to face the rigours of a British winter. Making all allowance for the capriciousness of climate in many southern health resorts, and the greater variations often experienced in different winter seasons in them, I am fully convinced of the benefits for certain patients derivable from change of scene, brightness, and solar influence which they afford. The mental effects thus secured count for very much with many invalids. I have, however, been struck by the alteration for the worse in the climate of parts of the Riviera, and of Egypt more particularly, in the course of the last thirty or forty years. Egypt is not what it was before the Suez Canal was cut, when I first knew it, and the new irrigation schemes have still more added to the moisture of the climate and the rainfall. The Red Sea climate has also materially altered in its upper portion, and cold weather, which was formerly unknown, is now frequently experienced there in the winter months. The best winter climates I believe to be met with in Upper Egypt, India, Florida, South California, and the Canary Islands. Malaga has been greatly neglected, owing to bad accommodation, but this is now quite rectified, and few localities surpass this station. In all these regions invalids are practically certain of a regular and unbroken climate. Every day is available for restoration, and no British station can compete with them. To take advantage of these, however, is a question touching the pockets, tastes, and circumstances of the indi-

vidual patient and his relations. Many English invalids are so unhappy abroad, and so insular, that they dread all foreign influences and severance from their ordinary environments, and become home-sick. Others, again, of more cosmopolitan tastes, are only too glad to seek recovery in fresh and inspiring scenes, and in each case due regard has to be paid to the exact physical condition of the particular invalid.

I have always agreed with Hughes Bennett, my old preceptor, that no climate in the world exceeds in beneficial influence that of the Scottish Highlands from June to the end of October. This is especially true for cases of phthisis, and I regard, as did Sir William Gull also, the air in these localities as far finer and more restorative than that of the Swiss Alps at the same season.

If I should appear to depreciate the merits, and they are not few, of many of our British winter health resorts, I may add that I have no particular desire to do so, but am only concerned to express my opinion of them for what it is worth. Almost any country climate is a boon to dwellers in large towns, and we are thankful for small mercies when we can deport our invalids to clean air and the possibility of some sunshine ; but when all is reckoned up, including our specia advantages in food supply, drainage, and polite amenities, I think it must be conceded that many of our best winter health resorts are, from no avoidable circumstances, inferior on the whole to many others to be met with beyond the British Isles. It may be further affirmed that the expense entailed by a sojourn in our best health resorts is commonly rather greater than that which is required in many of the foreign ones, although the cost of the journeys to and fro may tend to equalise this. Still, I am disposed to think that there is more to be had for the money in most of the favoured foreign stations.

I would lastly refer to one matter in relation to a winter sojourn anywhere for invalids. I believe that most of them return too soon to their homes. It is a common belief that winter in England ends with March. I believe it is more true to state that it often ends about the third week in June,

when cold east winds cease to prevail. Invalids leave their winter stations just when they are becoming most attractive and beneficial. They have often become tired of their banishment, or they can no longer bear the cost of it. I have sometimes believed that the medical attendants have grown tired of their patients, and are not sorry when the so-called season comes to an end. Be this as it may, it is usually unwise for many invalids to return home from suitable resorts in the belief that they will find a genial spring or early summer awaiting them. Many of us know how disastrous such a course may prove.

Once more, we have to bear in mind Trousseau's dictum, viz., that "chronic diseases require chronic therapeutics." One winter's sojourn in an appropriate place may do much for our invalids, but several winters thus passed will almost certainly do much more for them, if these advantages can be secured. And such benefits are not only for tuberculous patients, they are to be expected for sufferers from chronic bronchitis, emphysema, and chronic forms of rheumatism, gout, and nephritis. Our greatest difficulties arise in connection with patients of restless and nervous disposition, the victims of luxury, feeble digestion and insomnia, the *malade imaginaire*, the sensitive, introspective hypochondriac, for whom nothing is found to be appropriate either in respect of climate, diet, or medication. Such patients wander from place to place and find salvation nowhere. You all recognise such patients. If they scoff at plain common-sense directions "to wash in Jordan," they have already tried Abana and Pharphar without any benefit. The only satisfaction in dealing with these people is the realisation that you will not long be troubled with them, and that they will soon pass on into other hands.

This Society has yet much to do, as your President has already stated, in striving to formulate, or determine, principles which shall aid in the accurate prescription of appropriate climates for our patients, and I cannot doubt that if its efforts are thus directed, this work will gradually be accomplished. Many health resorts are really possessed of several climatic

conditions and influences within very short distances, and so are appropriate for varieties of patients. We cannot always account for the intrinsic virtues thus possessed. These are, however, generally well understood and appreciated by the local doctors.

I am afraid some of my hearers to-day may consider that I have not come here to bless our British winter health resorts. If my very brief and inadequate sketch of them, and my very general remarks upon them, shall provoke a more vigorous defence of their qualities and excellence at your hands, I shall feel that I have not inflicted any harm upon them, or altogether wasted your time and patience.

Original Communications.

VOYAGES D'ETUDES MEDICALES.

BY LEONARD WILLIAMS M.D., M.R.C.P.
Assistant Physician to the German Hospital.

THE scheme which was inaugurated six years ago under the above title has just concluded the first voyage of the second series. For the purposes of the scheme France is divided into five districts, viz., the Centre, the Western Pyrenees, the Alpes, the Vosges, and the Eastern Pyrenees. With the visit of 1903 to the last named the first series was brought to a successful close. Some doubts were expressed as to the advisability of commencing a second series, but the organisers decided that the number of French and foreign medical men who had not taken advantage of the first series being so large, it was reasonable to suppose that a second would be sufficiently appreciated. To judge by the success of the first of the new series this judgment was sound, and the management will probably look forward with confidence to another useful and instructive cycle. The stations visited this year included some of world-wide reputation, and others whose merits entitle them to a wider recognition than they have so far obtained in this country. Of the former, Vichy stands of course pre-eminent, a spa whose fame extends to all quarters of the civilised globe, and whose efficacy in suitable cases of gastric and hepatic derangements has been established for centuries. Scarcely less famous, to the initiated at any rate, is Mont Dore, which, if Vichy be correctly described as the gastric and hepatic spa, may claim to be considered *par excellence* the pulmonary spa. The bathing establishments (which include, of course, facilities for every conceivable kind of accessory treatment) at these two stations are positively astounding, not only in their size, but in their completeness, their elegance, their comfort, and their admirable organisation. To compare them to the very best in this country would be

to dwarf the latter into laughable insignificance; and even the finest among those in Germany, Baden Baden for example, can boast of nothing in size, equipment, or organisation which would not be equalled, or even surpassed, by their French rivals. La Bourboule, the neighbour of Mont Dore, is also well known; but, probably on account of the larger amount of salts, especially of arsenical salts, in its waters, its reputation lies not in the direction of pulmonary therapy, but rests chiefly upon the success with which delicate and anæmic persons, especially strumous children, are there treated. The waters have also an ascertained value in cutaneous diseases.

Another widely famous spa which was included in this year's trip is Royat. One has predilections in favour of places, much as one has them in favour of individuals, and I confess to such a predilection in favour of Royat. It is true that its situation is very attractive, but its elevation is only about 1,500 feet; and there is no special feature by which to explain the preference for this over a host of other places. Nevertheless, such a preference was very freely expressed by several members of the party, and is abundantly evidenced by the popularity of the station in France itself. Its close proximity to the large and interesting town of Clermont Ferrand, together with its complete detachment from the life of the latter, may explain some of its charm, in affording an ample safeguard against that element of *ennui* which is the bugbear even of the best managed health resorts. The waters of Royat contain, among the more active ingredients, common salt, and a very large proportion of carbonic acid gas. In view of this fact it has always seemed strange to me that they were not more freely used for the treatment of chronic cardiac complaints after the Nauheim pattern, a purpose to which their composition eminently suits them. The explanation is probably to be sought in the perhaps natural disinclination of the French to adopt anything which had its origin in Germany, but whether or not this be so, wiser counsels have at length prevailed, and every effort is now being made to give to Royat the place it deserves to occupy among the stations which are specially equipped by Nature for the

treatment of chronic cardiac disorders. It would be difficult, certainly, to select a place where not only the patient himself, but such of the members of his family as might accompany him, would find a clearer atmosphere, or more rational means of quiet and refined enjoyment.

Of the smaller places, those which appealed to me most were Néris, Chatel Guyon and St. Honoré; a list to which, on a slightly longer acquaintance, I might be inclined to add Pougues. But of the four, St. Honoré seemed to me to enjoy not only the greatest natural attractions, but the methods there employed possess the merit of some slight degree of originality. The surrounding country is very like England, a resemblance which is increased by the fact that the land-owner, the Marquis de St. Honoré, has a fine chateau situated in a well-timbered park in the immediate neighbourhood. The little place itself is very simple, but the hotel accommodation is good, and the *établissement* is well arranged. The tiles in the bath-rooms and the framing of the mirrors are made of a local pottery ware, which is simple and artistic. The feature of novelty about the method of treatment consists in douches for the feet only. The local physicians explain that it counteracts the tendency to determination of blood to the head, which is not infrequently apparent after some time has been spent in the inhalation room, and that it is useful in suboxidation and malassimilation. Another appliance which I do not remember to have seen elsewhere is a douche of steam which is made to play upon a particularly painful part. It is said to be very soothing, especially in cases of neuritis; a claim which a brief trial inclined me very readily to concede.

Taking a broad survey of the French stations which I have visited on this and other occasions, and comparing them with our own health resorts, there is one respect in which I can unhesitatingly claim superiority for the latter. This is in the matter of sanitation. The sanitary condition of all but the very best hotels in the best known stations leaves a great deal to be desired. Things have certainly improved very considerably during the last few years, and the improvement

is doubtless due in a large measure to the influence exerted by Dr. Carron de la Carrière's party of critics; but, in the smaller places, at any rate, much remains to be accomplished; and the sooner the local authorities realise that natural advantages and healing waters are worse than useless to the medical profession, unless they are backed by scrupulous public and private sanitation, the better it will be for the future prospects of the French resorts. We, in this country, have learned this particular lesson, in many cases by bitter experience, and our friends across the Channel will do wisely to remember that for English physicians the most important of all questions in connection with a health resort is the type and efficiency of its sanitation.

Another criticism which, as a climatologist, I feel bound to offer, is that it is very difficult—in many cases, indeed, it is impossible—to ascertain the degree of relative humidity of the stations visited. Humidity is all important in the estimation of climate, and climate is all important in the selection of health resorts; so that the omission to include this factor in the published data is a drawback which must militate seriously against the success of the various stations. I have little doubt, for example, that Royat owes the charm which characterises it largely to a low relative humidity. The residents dwell upon the fact that it is never damp there, but the definite figures obtained from observations would be infinitely more convincing.

Of one further complaint which I have to formulate, I may say at once that it does not by any means apply exclusively to France, but that the health resorts all over Europe, including even those of our own country, might profitably be made to answer to the same charge. This refers to the question of adequate ventilation in hotels, casinos, theatres, and other places where invalids are wont to congregate. In most of these places the state of the atmosphere is nothing short of disgusting, and until drastic measures are taken to ensure some measure of purity, it is a mere mockery to describe the stations as health resorts; they are merely places in which pathogenic germs are to be found in

greater abundance than elsewhere. A notable instance was afforded by the hotel at which we stayed at Mont Dore. Having regard to the fact that the station is known as the pulmonary spa, one would have expected that some of the truths upon which the open-air treatment of pulmonary diseases are based would there find some recognition. But so far was this from being the case, that an attempt on the part of some of us to obtain an open window during an interminable dinner on a hot night, in a room only barely sufficient to accommodate the party of about 120, was not only fruitless, but was received by the *maitre d'hotel* as a request which was as outrageous as it was uncalled for. The same absence of the first principles of pulmonary cleanliness is writ large in every casino, and nearly every theatre; and as to the inhalation rooms, which constitute so important a feature at many of the spas, I would personally much rather suffer such inconveniences as my malady might impose, than risk the consequences of introducing into my lungs the pathogenic germs which the other occupants are exhaling into the moist, unventilated surrounding medium. As a startling exception to the almost universal lack of enlightenment in this direction, I gladly and gratefully record the fact that the theatre of the casino at Vichy was the best ventilated building of its kind that I have ever been in.

For the rest, I have nothing but praise for the manner in which the French health resorts are conducted. The most important question in spa treatment, when that of the suitability of the spa is decided, is the question of the local physicians. Now the local physicians at the French stations are exceptionally intelligent, well-equipped men, who have a thorough knowledge of all that pertains to balneological procedure in general, and of the special virtues of particular waters and localities. Those whose only knowledge of the French is derived from the froth of Parisian life, are apt to run away with the idea that lightness and frivolity are the national characteristics. An acquaintance with any large number of our French *confrères* will convince anyone that this is not so, for it would be difficult to find in any country

a body of men more earnest in their work and more serious in their recognition of their responsibilities than those who practise medicine and surgery on the other side of the Channel.

The Voyages d'Etudes Medicales, though quite adequately advertised in the principal medical journals, have so far attracted very few people from this country. To those who have taken part in them this must seem strange. The trip lasts on an average about a fortnight, the price charged (from £10 to £12) is very moderate; the facilities for making the acquaintance of the broad features of each station are excellent; the arrangements for the comfort of the travellers are altogether admirable; the food and accommodation are all that could be desired by the most fastidious; and the opportunities of widening one's knowledge of all matters pertaining to the management of health stations, and of exchanging ideas with experts, is unsurpassed. At each place the indications for that place are set forth in a lecture by Dr. Landouzy, the learned Professor of Therapeutics at the University of Paris, who acts the part of director of ceremonies during the whole voyage. The eloquence of this gentleman, his resource, his versatility, and his wit, are no less conspicuous than the learning for which he is justly famous. The French are a nation of orators, and M. Landouzy is an orator among orators. The company itself, on the three occasions when I have been present, has been sufficiently cosmopolitan, the French and the Belgians naturally predominating. On each occasion the English have been very few. This fact is one which is much to be deplored from every point of view. The French spas are as well equipped and as well managed as any to be found in Europe, and English physicians are doing both themselves and their patients a great injustice in not seizing the exceptionally favourable opportunities afforded by the Voyages d'Etudes Medicales for acquainting themselves with the advantages to be obtained from the treatment at these stations.

Next year's trip is to be the Eastern Pyrenees. Besides Pau, Biarritz and Acachon, it includes such important stations

as Luchon, Cauterets and St. Sauveur, together with other stations of lesser fame. The scenery is exceptionally grand and imposing, and would, apart from any other consideration, afford attractions even to a mere pleasure seeker. To judge by a previous experience of a voyage in this district, it will prove a delightful means of spending a profitable holiday, and it is to be hoped that many English physicians will avail themselves of the opportunities thus offered.

PHTHISIS VIEWED IN RELATION TO DARTMOOR, TO DEVONSHIRE IN GENERAL, AND TO CONSTITUTION.

BY WILLIAM H. PEARSE, M.D.EDIN.

LORD BACON says: "Let us consider the false appearances which are imposed upon us by words, . . . and although we think that we govern our words . . . yet certain it is that words, as a Tartar's bow, do shoot back upon the understanding of the wisest, and mightily entangle and pervert the judgment, so as it is almost necessary in all controversies and disputations to imitate the wisdom of the mathematicians in setting down, in the very beginning, the definition of our words and terms."

If we examine deeply and closely, we shall find ourselves unable to define the word phthisis.

Approached by the cellular pathology of Virchow, of 1858, phthisis had essentially a cellular basis in tubercle, "always a pitiful production, a new formation, from its very onset miserable." Virchow was the Apostle of Continuity in Pathology, he says: "I will . . . endeavour . . . to furnish you with proofs that every pathological structure has a physiological prototype, and that no form of morbid growth arises which cannot in its elements be traced back to some model which had previously maintained an independent existence in the economy."

Since Virchow's great announcement of biological and pathological cellular continuity, Koch has discovered the great place which bacilli holds in phthisis. But neither the philosophy and facts of Virchow nor of Koch cover the field of phthisis, for we see that, in the main, only certain types of individuals pass into phthisis and at certain definite ages only. These facts carry us out beyond and further back than can be expressed by either a cellular or bacillary pathology; we are carried into the widest fields of orderly evolution and con-

tinuity, as are expressed by the old Eastern poet: "And in Thy Book all my members were written, which in continuance were fashioned, when as yet there was none of them."

This *a priori* philosophy of orderly evolution in continuity must ever govern our method, both in and beyond cellular and bacillary pathology. The pollen in vain falls on the stigma, except at a certain period of receptivity; the bacillus falls in vain on lung bioplasm except at certain ages, and in certain types of individuals, these individuals having had a far back reaching—individual or ancestral—series of disturbed biological correlations, both of structure and function.

My standpoint in viewing phthisis is neither cellular nor bacillary, but is that of a varied stream of individuals who exhibit all the stages of prephthisis and phthisis; in the prephthisical cases I see the varied long-preceding deviations of structure and function—a kaleidoscopic view in its variety, but always within a somewhat definite range of structure and function. I am cast back, as if old, into premicroscopic method, viz., that of observing Nature as presented, and I hope guided by just philosophic analogy and method; for it cannot be denied that empiricism and observation are not dead as parts of true method.

From these remarks it will be clear that we cannot give a definition of phthisis; we can only approach its wide form or nature through its many channels or origins.

DARTMOOR.

De la Beche describes Dartmoor as "an elevated mass of land, of an irregular form, broken into numerous minor hills, many crowned by groups of picturesque rocks—provincially termed 'Tors,'—and for the most part presenting a wild mixture of heath, bog, rocks, and rapid streams." It is of granite, and extends 22½ miles from north to south, and 18 miles from east to west; the highest point is Yes Tor, 2,028 feet, on the north of the region; the highest south elevation being Shell Top, 1,546 feet.

The whole region forms the central elevated part of a peninsula which runs out into the Atlantic Ocean; it receives

the full flow of the Atlantic gales from south-west to north-west; is a region of wind, rain, mist, and in the summer of fresh breezes and hot sunshine.

Whilst the mean rainfall at Exeter for eight years was 33·82 inches, that at Princetown, 1,400 feet elevation, was 59·92 inches, at Rundle Stone 74·35 inches; both these places are in central Dartmoor; Sheepstor, on the west, had a rainfall of 64·66 inches. For the tourist or the comparative invalid on Dartmoor, the whole region, except the actual Tors, is gently undulating, moderately hilly, and easy of access. Dartmoor impresses the wanderer as being greater and wilder than its size and moderate elevation would lead one to expect. There is ceaseless variety in the scenery. Walking over Dartmoor, the physical body, the mind, and emotions or imagination, are all under a moderate but yet powerful stimulation. I feel sure that the mental and emotional stimulation, no less than the physical, which Dartmoor compels, are powerful influences for good and for health in the prephthisical and in other states verging on disease.

Great fields of observation are open to the tourist—of meteorology, geology, botany, archæology, &c.

Our knowledge of the deeper activities of the atmosphere is but slight. This may be illustrated by a quotation from Professor Fleming's lecture at the Royal Institution, May 30, 1902, on the "Electronic Theory of Electricity": "Electrons were the basis of chemical action; these were always being produced in sunshine and bright light. It was a curious fact that the air at the foot of waterfalls was negatively electrified, whilst near sea waves it was positive. This might account for the difference in benefit derived by different people from sea and mountain air." The immense influence of "change of air" on health is probably due to infinitely delicate differences in the "energies," "modes," and conditions of the atmosphere to which the energies of the bioplasm reciprocate.

The influence of the activities of the summer climate of Dartmoor on those who, with varied functional failures, are verging into phthisis and other failures of health, are very striking, and in their operation recall Goethe's words: "Never

did Nature in her effluent powers of life refer to days and hours, she acts in calm and regulated course, knows nothing of this accidental force, e'en in her works of most sublimity, as in her least, no violence knows she!"

To illustrate the influence of Dartmoor on phthisis, West Dartmoor, which receives the full burst of Atlantic winds, rain, &c., gives as follows:—

Parish	Mean Population of Parish	Total Deaths of Phthisis in 10 Years		Death-rate		Acres to Person	Geology	Death-rate		Mean Death-rate M. & F.	Average Acres to Person
		M.	F.	M.	F.			M.	F.		
Meavy ...	271	1	1	0·73	0·75	12·1	Granite	—	—	—	—
Sheepstor ...	103	0	2	0	4·0	34·9	,,	—	—	—	—
Walkhampton	731	3	2	0·78	0·57	14·4	,,	—	—	—	—
Stampford Spiney	506	3	1	1·25	0·37	3·4	,,	—	—	—	—
Peter Tavy ...	417	3	0	1·44	0	8·3	,,	0·84	1·13	0·98	11·13

It should be remarked that the high death-rate of women in Sheepstor was due to one family, who were strangers to the district, and in which two sisters died of phthisis. Omitting this family, the female death-rate of the moorland granite district is 0·36. This great freedom from phthisis finds a parallel in a similar freedom of the North Devon coasts, where the death-rate was M. 0·50, F. 0·21.

This ratio is as to M. 2·46, F. 2·48, for England and Wales during the same years.

Both Western Dartmoor and North Devon get the full Atlantic winds, and atmospheric activities. Our scientific knowledge of the potential and kinetic activities of the atmosphere is elementary, but we know empirically, and from the experience of mankind, that the incessant movement, and intermovement, must correlate with great "energy," energy physical in all its modes, and *à fortiori* with vital "energy," in absolute continuity.

Here is the result, women's death-rate from phthisis in the two regions being respectively 0·36 and 0·21.

Another granite region is that of South Dartmoor, with a mean death-rate from consumption of 1·46, *i.e.*, M. 1·01, F. 1·92.

Parish	Mean Population of Parish	Total Deaths in 10 Years		Death-rate		Acres to Person	Geology	Mean Death-rate		Mean Death-rate M. & F.	Acres to Person
		M.	F.	M.	F.			M.	F.		
Harford ...	164	1	2	1·23	2·44	12·4	Granite	—	—	—	—
Cornwood ...	1083	10	10	1·82	1·87	9·8	„	—	—	—	—
Shaugh ...	592	4	4	0	1·49	14·7	„	1·01	1·92	1·46	11·6

Shaugh, with a mean male population of 325, had no death from consumption in ten years. Ermington, with a mean female population of 972, had no death from consumption in ten years. Rainfall at Ridgway, 47·92 inches; Hemerdon 49·26; Ivybridge 49·05 inches, these being neighbouring districts.

The Newton Abbot district has a varied geology; there are sea-board, Devonian, Carboniferous, mixed New Red Sandstone with Carboniferous, Bovey Beds, and Granite. The granite sub-region, including Lustleigh, Moreton, North Bovey, Manaton, Widdecombe, Buckland, had a consumptive death-rate of 1·49, being the least of any of the areas of Newton Abbot district, but the death-rate was higher than that of Western Dartmoor; *e.g.*, Widdecombe-in-the-Moor had 2·15 M., 0·72 F., against 0·84 M., 0·36 F., of the Tavistock granite area.

Sometimes a high death-rate affects the females of this region; *e.g.*, Manaton, on the granite, 3·14; Abbot's Kerswell, 3·7; Combeinteignhead, on the Sandstone and Devonian, 3·11; Ipplepen, on the Devonian, 3·73; Trusham, on the Carboniferous, 4·46.

The rainfall at Torquay is 37·69 inches; Bovey Tracey, 44·01; Widdecombe, 58·95; Asburton, 51·38.

The granite region in relation to consumption is seen in the following table—

Parish	Mean Population of Parish	Total Deaths in 10 Years		Death-rate		Acres to Person	Geology	Mean Death-rate		Mean Death-rate of M. & F.	Acres to Person
		M.	F.	M.	F.			M.	F.		
Lustleigh ...	320	4	0	2·5	0	9	Granite	—	—	—	—
Moreton ...	1509	12	9	1·62	1·16	5	,,	—	—	—	—
North Bovey	514	4	5	1·4	2·12	10	,,	—	—	—	—
Manaton ...	409	3	6	1·38	3·14	15	,,	—	—	—	—
Widdecombe	877	10	3	2·15	0·72	12	,,	—	—	—	—
Buckland ...	110	1	0	1·7	0	13	,,	1·79	1·19	1·49	10

The people of this fine region were, during the ten years, relatively free from phthisis; the M. and F. mean being 1·49.

Dartmoor also includes the following region in its south borders:—

Parish	Mean Population of Parish	Total Deaths in 10 years		Death-rate		Acres to Person	Geology	Mean Death-rate		Mean Death-rate of M. & F.
		M.	F.	M.	F.			M.	F.	
Buckfastleigh ...	2590	24	42	1·94	3·10	2·3	Granite (part)	—	—	—
Holne	338	1	2	0·57	1·22	11	,,	—	—	—
Dean Prior ...	410	4	4	1·99	1·91	10	,,	—	—	—
South Brent ...	1326	10	17	1·51	2·56	7	,,	—	—	—
Ugborough ...	1502	9	8	1·21	1·05	5	,,	1·44	1·96	1·70

The death-rate in Buckfastleigh is high amongst the women, 3·10.

The sea-board of North Devon, on the Devonian formation, showed a remarkable freedom from phthisis. From the Foreland Cape on the extreme east to Baggy Point on the extreme west of the North Shore are the parishes enumerated in the following table:—

Parish	Mean Population of Parish	Total Deaths in 10 Years		Death-rate		Acres to Person	Geology	Mean Death-rate		Mean Death-rate M. & F.
		M.	F.	M.	F.			M.	F.	
Countisbury ...	192	0	0	0	0	18	Devonian and Sea	—	—	—
Brendon... ...	271	0	0	0	0	24	"	—	—	—
Lynton	1106	1	0	0·19	0	6	"	—	—	—
Martinhoe ...	214	0	0	0	0	11	"	—	—	—
Parracombe ...	373	0	0	0	0	11	"	—	—	—
Trentishoe ...	114	0	0	0	0	13	"	—	—	—
Kentisbury ...	404	1	0	0	0	7	"	—	—	—
Coombe Martin...	1451	1	0	0·5	0	2·6	"	—	—	—
East Down ...	412	0	0	0·13	0	8	"	—	—	—
Berry Narbor ...	763	3	1	0	0·26	6·4	"	—	—	—
Bittadon ...	60	1	0	0·78	0	10	"	—	—	—
Morthoe... ...	349	2	2	3·8	1·09	13	"	—	—	—
Georgeham ...	794	0	6	1·20	1·47	5	"	0·50	0·21	0·35

Thus the mean death-rate from phthisis for ten years in this bold sea-board region was 0·50 M., 0·21 F. This splendid region west of Exmoor, and bordering on the sea, and open to the west and north-west Atlantic winds, is almost free from consumption. Coombe-Martin, mean population 1,451, had one male only die in ten years.

Lynton, mean population 1,106, had one male only die of phthisis in ten years. During the same period no female died of phthisis in either parish.

The following parishes on the North Devon Devonian, with the mean population annexed, had no deaths from consumption during the ten years 1861-70: Brendon, 271; Parracombe, 373; Bratton Fleming, 632; Stoke Rivers, 225; East Down, 412; Countisbury, 192; Martinhoe, 214; Trentishoe, 114.

The following North Devon parishes, on the Devonian,

with the mean population annexed, had each one death from consumption in the ten years, 1861-70: Challacombe, 282; Kentisbury, 404; Arlington, 229; Bittadon, 60; Lynton, 1,106; Coombe-Martin, 1,451; West Anstey, 300; East Anstey, 227; Twichen, 238.

The town of Ilfracombe, judged as to some extent a resort of invalids, had a small mortality—M., 2·08; F., 1·75.

The rainfall was high in healthy districts: Bratton Fleming, 53·22 inches; Martinhoe, 60·82; having no deaths from phthisis in ten years. Ilfracombe rain-fall, 37·51; Barnstaple, 39·47.

The South Molton district has 30 parishes, nine being on the Devonian, on the south-west borders of Exmoor. In these parishes the death-rate was M., 0·56; F., 0·97; mean, 0·76.

There are also twenty-one parishes, south of the above, and on the Carboniferous system; their death-rate was M., 0·88; F., 1·09; mean, 0·98; or slightly higher for the Carboniferous system than for the more northerly Devonian. The death-rate is rather higher for women than for men.

The higher death-rate of the Carboniferous system is seen also in the Holsworthy district, where it was M. 1·77, F. 2·35. Holsworthy district is known as a clayey, damp, "cold" soil. Dr. Buchanan's researches showed "that a wetness of soil is a cause of consumption to those living on it." But it is the women who die in excess. Dr. L. Ash considered that the bad condition of the cottagers' huts predisposed to phthisis in the women.

The district of Axminster has nineteen parishes: the death-rate for men was 1·44; for women 2·16. The highest death-rates were in Axminster parish, 3·58; Hawkchurch parish, 4·25; in both instances women. A similar high rate for women existed in Torrington, 3·08; also in Buckfastleigh, 3·10; Honiton, 2·35.

By the kindness of Dr. Power and Dr. Saunders, I was supplied with the return of mortality from phthisis for the Dartmoor convicts during the ten years 1866-75, and for the Lunatic Asylum at Exminster during the ten years 1861-70.

DEATHS FROM CONSUMPTION IN DARTMOOR PRISON DURING THE TEN YEARS 1866-1875, SUPPLIED BY DR. POWER.

Date	Number of Prisoners	Total Number of Deaths	Deaths from Consumption	Death-rate
1866	627	13	1	—
1867	613	8	2	—
1868	636	10	2	—
1869	739	7	3	—
1870	881	14	8	—
1871	902	5	2	—
1872	958	13	3	—
1873	943	8	1	—
1874	934	7	1	—
1875	943	8	3	—
Totals	8,176	93	26	—
Means	817·6	9·3	2·6	3·1

The mean death-rate of the prisons, 3·1, stands out in contrast with that of the asylum, 20·16.

The prisoners lived at an elevation of 1,400 feet with a rainfall of from 59·92 to 74·35 inches, in the midst of high winds, fogs, and active atmospheric processes; their wards and workrooms are lofty; they spend much time also in out-of-door employment.

The lunatics at Exminster were no less cared for as to pure air and full cubic space, and in all other physical surroundings. The death-rate of the non-asylum people in Exminster parish was 3·37. The nearby parish of Kenton, with a mean male population of 875, had, during the same ten years, a male death-rate of 0·57; with a mean female population, during the same period, of 1,034 there was no death from phthisis. Thus the locality of the asylum was healthy; its inner surroundings and management were perfect.

The causes or biological conditions which led to the asylum mortality of 20·16 must be sought in those wide and

infinite correlations of the system involved in the words—the constitution of the insane.

The following table exhibits phthisis in Exminster, and in its asylum; the asylum returns were furnished by Dr. Saunders:—

PHTHISIS, EXMINSTER ASYLUM, 1861-1870.

	Total Parish		Asylum		Parish, excluding Asylum	
	M.	F.	M.	F.	M.	F.
Total Mean Population ...	865	986	270	398	595	588
Total Deaths from Phthisis ...	83	97	60	80	23	17
Percentage	9·59	9·83	22·22	20·10	3·86	2·89
Mean Percentage	9·71		20·16		3·37	

I am, in this paper, viewing phthisis in a wide biological aspect. Herschel says: "There is something in the contemplation of general laws which . . . pursuades us to commit ourselves unreservedly to their disposal; while the observation of the calm, energetic regularity of Nature, the immense scale of her operations, and the certainty with which her ends are attained, tends irresistibly to tranquillise and reassure the mind." We shall not, therefore, shrink from submitting our method, in harmony with the doctrine of orderly evolution and continuity; we use this method now as an *a priori* truth, and not least so in the regions of biology and pathology.

I have used the words, "constitution of the insane" as holding the potential modes, which, sooner or later, are apt to show as phthisis; though we associate insanity with the brain, yet it is a fatal error of method in biology to view the brain and mind as distinct and separated from other structures and functions of the system. The brain (epiblast)—mind and emotions—so disturbed in the insane, correlates with the body as a whole, with the sexual functions (mesoblast), the thyroid (hypoblast), &c.

It appears to me to be a matter of much interest to observe,

record, tabulate, and correlate the variations of structure and function, both of those who are in the hovering stages of prephthisis and of those who are in actual phthisis. A study of the biological deviations of structure and function of those of the insane who pass into phthisis would be important in biology and pathology.

The Exminster experience demonstrates a loss, too early in the life of the individual, of vital energy in the molecular bonds of lung-apex bioplasm in those who are insane. This lung-apex bioplasm in the insane, at varying ages, yields to the stronger molecular attractions of the unicelled bacillus. Biologically, the lungs are a late and extremely differentiated evolution; they "arise as two separate hollow buds, and are protrusions from the œsophagus" (Landois and Sterling). Like other remote parts of the body, they are apt to lose, or to have expended, their vital energy early in the life of the individual.

I have for twenty-five years recorded every case of prephthisis and phthisis which has presented, where I could trace heredity, noting the correlations of structure and function. I have appended a table which exhibits these correlations.

It will be seen that the basis of phthisis extends back to former generations; also that structure and function correlate; deviation of structure in one generation may have its analogue in disturbed function in another generation, and phthisis in a third generation. These basic deviations of the biological evolution, of those who tend to phthisis, may thus be atavic and alternate. We are reminded of Darwin's words: "We are led to believe, as formerly explained, that every character which occasionally reappears is present in a latent form in each generation." "In every living creature we may feel assured that a host of lost characters lie ready to be evolved under proper conditions."

The differentiations of every layer of the blastoderm are involved; their deviations or disturbances, as in prephthisis, often correlate and alternate during many generations.

The instance of like-handwriting, transmitted through many generations, and in the male line, will show us how

Correlations of Phthisis and Prephthisis.

	Father died of Phthisis	Mothers died of Phthisis	Brothers died of Phthisis	Sisters died of Phthisis	Grandfathers on father's side died of Phthisis	Grandmothers on father's side died of Phthisis	Grandfathers on mother's side died of Phthisis	Grandmothers on mother's side died of Phthisis	Uncle on father's side died of Phthisis	Aunt on father's side died of Phthisis	Uncle on mother's side died of Phthisis	Aunt on mother's side died of Phthisis	Cousins on father's side died of Phthisis	Cousins on mother's side died of Phthisis	Sons died of Phthisis	Daughters died of Phthisis
Phthisis— 42 men 64 women	20	36	19	32	3	7	4	3	13	13	3	14	1	2	—	19
Prephthisis— 43 men 161 women	61	45	52	74	3	1	6	4	21	20	14	46	5	6	1	3

	Bone System: Hands	Clavicles	Nose	Terminal Cartilages of Nose	Thorax and Skeleton	Skin System: Nails	Hair	Eyebrows	Ears	Teeth	Congenital absence of Upper L. Incisors	Sexual: Amenorrhœa	Total Amenorrhœa	Menorrhagia	Barren	Varied: Hæmoptysis	Malarial Fever	Anæmic
Phthisis— 42 men 64 women	31	2	75	60	18	67	16	28	7	25	1	25	—	1	4	—	1	—
Prephthisis— 43 men 161 women	43	3	113	86	11	99	21	34	2	33	3	45	5	4	9	8	—	1

	Digestive: Indigestion	Costive	Anorexia	Smoked food, much liked	Onions "	Salted food "	Pickles "	Pork "	Cheese "	Neuroses: Weakness	Wasted	Sweats	Coldness	Heats	Diabetes	Eczema	Neuralgia	Phos. Acid in Urine	Goitre
Phthisis— 42 men 64 women	12	1	20	5	45	16	17	8	5	32	9	2	31	9	1	1	17	1	—
Prephthisis— 43 men 161 women	46	3	16	4	19	25	35	5	9	61	9	8	41	—	6	6	11	—	2

profound and powerful are the molecular motions or modes of the sperm cell; not less delicate, yet all-powerful, are those modes of the ovum and sperm cells, which are eventually showed in the varied correlations of structure and function of the prephthisical, and which, in many, appears as a more or less, in different individuals, expended vitality of one long apex.

Whilst Exminster Asylum reveals a part of the deep biological basis of phthisis, the influences of full physical energies, in the surroundings of West Dartmoor and North Devon, reveal its modes of prevention, *i.e.*, the placing the living unit in the midst of those physical energies which make for and sustain vital processes. But as the organic evolution involved vast periods of time, and energies of infinite power, yet delicate, so the influences and powers of Dartmoor, &c., must be applied in submission to the harmony of the laws of Nature—"No violence knows she."

But it is a well-established fact that the summer months spent on Dartmoor give, in their physical and psychical influences, a renewal of life to the faltering vital energies; this is especially so to those in the hovering failures of vital energy of prephthisis.

My experience of the streams of prephthisis and phthisis which pass before me, both in the correlations of structure and function, in their atavism and alternation, recalls the words of Goethe:—

> "Oh! How the spell before my sight
> Brings Nature's hidden ways to light.
> See! All things with each other blending—
> Each to all its being lending—
> All on each in turn depending—
> * * * *
> While everywhere diffused is harmony unending."

DEEP BREATHING.

BY RICHARD COLE NEWTON.

MONTCLAIR, N.J.

THE great Napoleon preferred a man with wide nostrils, presumably because his breathing facilities are better. The questions of improving a man's breathing facilities and the accruing advantages are what I ask you to consider with me this morning.

Perhaps the best way to approach this subject is to define what is meant by the term "deep breathing." I take it to mean voluntary and full inflation of the lungs carried to the fullest extent, slowly and regularly performed, and generally accompanied by movements of the arms, chest and abdominal walls. It may also be performed by the aid of various devices and instruments, such as spirometers, inhalers, respirators, &c., some of which are efficient and convenient. Its object is to fully inflate and bring into activity the whole volume of the lungs, both the parts commonly used and those that in shallow or ordinary breathing are unused; and by exercise to increase the capacity of the lungs and improve their efficiency.

By this increase of respiratory capacity, the action of the heart and blood-vessels will be strengthened and the oxygenation of the blood will be increased, with the result that all the tissues will be better nourished, metabolism will be better carried on and secretion and elimination will be more perfectly accomplished. Every bodily function will be better performed, and in none will the improvement be more manifest than in digestion and the assimilation of food.

The quantity of air which a man breathes in ordinary expiration and inspiration is about 500 cc., while the complementary air, or the amount which can be inspired after an ordinary inspiration, is 1,500 cc., and the reserve air, or the amount which can be expired after an ordinary expira-

tion, is from 1,240 to 1,800 cc. (1). In fact, our breathing apparatus is said to be one fourth larger than necessary (2) for the ordinary requirements of life, and only careful and systematic training will bring the entire volume of the lungs into use.

Campbell (3) says, "Another advantage, much overlooked, attached to good pulmonary development, *i.e.*, the facility which large lungs afford to the circulation through them. The greater the vascular capacity of these organs, the less is the work thrown on the right heart. Now all the diseases of the left heart, but especially of the mitral orifice, tend to cast extra work on the right heart. Hence the great importance in all cardiac diseases of securing the maximum development of the lungs, and in no way can this be more effectually done than by respiratory exercises systematically carried out. In this manner we can in a short time increase the pulmonary capacity to a marked degree. The respiratory movements favour the circulation of the blood. With every inspiration blood is sucked into the right heart, while the pulmonary flow is at the same time quickened. They further aid the lymphatic circulation, pumping the lymph from the peritoneal cavity into the pleuræ, and from the latter and from the pericardium into their respective lymphatics, and hurrying on the lymph in this way. Such aids to the lymph flow are of the greatest importance in many diseases, but above all in heart disease. In various forms of dyspepsia, as in torpid liver, I have found the greatest benefit from their use, from the pressing and in some cases dislocating the abdominal viscera."

Braum (6) has shown how numerous are the arrangements connected with the fasciæ for promoting the venous currents by means of the negative pressure resulting from the movements of the body. Farquharson (13) states in his work on Ptomaines that every arrest or detention of the respiratory functions is followed by the retention of toxic physiological *débris* in the body, and points out that the so-called pre-

tubercular symptoms are such as might be expected from self-intoxication caused by imperfect respiration.

Jaret has shown (4) that altitude produces increased hæmoglobin and an increased number of red blood corpuscles, with decrease of nitrogen in the secretions. In animals he found that a reduction of the atmospheric pressure equivalent to 100 mm. alone, apart from any other factor of mountain climate, was sufficient to change the composition of the blood in the same way as is observed after a trip to the mountains. The total increase in the hæmoglobin was 20 per cent. The dryness, cold and other features of high altitude, tested separately, had no effect upon the composition of the blood. The amount of nitrogen retained by the organism was much more than could have been required for the new formation of the elements of the blood. This suggests that the action of altitude is not restricted to its effect upon the composition of the blood, but that it may induce a partial protoplasmic regeneration throughout the organism, conferring new vitality and resisting power on other elements beside the blood. In other words, if the inspired air is rarefied so that the lungs must expand more completely in order to take in enough air to oxygenate the blood, not only are the hæmoglobin and the number of erythrocytes increased, but the amount of nitrogen taken into the tissues is augmented and a general condition of increased metabolism induced.

The result of these laboratory experiments accords well with clinical experience.

One writer (5) has suggested that mankind would be less liable to consumption if the atmosphere which they breathed contained less rather than more oxygen. Unquestionably the principal advantage in nose breathing over mouth breathing is that the former requires more effort on the part of the lungs, and this tends, as Campbell has shown, to lighten the work of the heart, (*a*) mechanically by helping along the movement of the blood, and (*b*) by increasing its oxygenation. This latter function is augmented by the increased lung expan-

sion in nose breathing, the greater effort required draws more air into the alveoli and distends these spaces more fully, and so exposes to the inspired air a larger area of capillaries. As proof of this statement witness the deleterious effect of mouth breathing on athletic exercises. It is well known that a runner, for instance, must breathe through his nose, although breathing through the mouth is much easier during strenuous exertion, but he will be "winded" much sooner with his mouth open than if he kept it shut.

Ingals (16) says, "by a few deep inspirations the healthy individual, who has exhausted his breath, will find that he speedily recovers it; whereas by the usual respiratory efforts he will pant for several minutes before he can obtain relief." In other words, it is deep, full and slow breathing which properly aerates the blood, not quick, panting and shallow respirations.

It is not the purpose of this paper to take up the physiology nor the therapeutic value of bodily exercise in general, although it is impossible to discuss deep breathing without some reference to general muscular exercise. What the writer fondly hopes is to provoke some general discussion on this important subject, and himself to learn from the opinions of others more about a question that is not yet well understood and is too little spoken of by medical teachers and writers generally. After a conversation with a physical trainer and a so-called physical culturist of national repute, the writer could not avoid the conviction that the profession has much to learn in reference to these matters, and not only that, but the corollary was equally obvious that if we are to be prepared to meet and answer the claims and pretensions of physical culturists and osteopaths, we must undertake all manner of investigation into every aspect of physical development, massage, pulmonary gymnastics and general and special exercises and movements. Hartwell says (9), "It seems a misfortune or worse that the profession is as yet unprepared or unwilling to speak with authority on the uses and abuses of exercise." Perhaps nothing is more striking than the more or less con-

temptuous way in which physical trainers, &c., speak of the medical profession; and that this contempt is partially, at least, deserved, certain remarks of Professor Hollis, of Harvard, in a paper on College Athletics, seem to prove. Speaking of the employment of a professional trainer the Professor says: "The professional seldom possesses the ideals which should prevail in a college atmosphere. His introduction probably springs from the difficulty of getting practical advice from the doctors. Their experience has usually been with sick men. When confronted with the problem of taking care of well men they seem to fail."

So far as my experience has gone, the strictures of Professor Hollis are little if any too severe; and it is because I believe that the time has now come when we must arise to the situation and must be able to inform our patients whether they should exercise or not, and if so, should be able to instruct them fully as to the best and safest form of exercise, that I have ventured to take up so much time with a paper of this sort. It is impossible for me to try and cover the whole ground, and what follows is meant to be rather suggestive than conclusive.

I believe that you will all admit that deep breathing is for a person in health safe and desirable, but it seems to me that the fact that few people breathe properly is too little known to either the profession or the laity. Our own Otis (9) says, that after examining (12) 1,500 chests he has found very few individuals who breathe fully and properly; Minor says, not one in twenty (10); Ingals (11) observes, "It is a matter of surprise to those who have given the subject thought to find how superficially many people breathe, and how little they know of this most important physiologic process." And one of the physical culturists spoken of above says that after measuring the lung capacity in 20,000 persons, he finds that not 1 per cent. of them has strong lungs and breathes fully. He also asserts that consumption is the athletes' disease, and that the majority of athletes die of it, and claims to have a list of two hundred athletes, prize

fighters, &c., who have succumbed to the disease. He further asserts that this loss of life is entirely needless and is due to a failure to develop the respiratory apparatus commensurate with the voluntary muscles. Had the balance between these functions been maintained, he argues that the health would not have suffered, but on the contrary would have been greatly benefited by the muscular training. After a prolonged conversation with the gentleman I am convinced not only of his honesty but of his intelligence. In corroboration of his position I may quote Stecker, who says (30), an inherited predisposition to phthisis may be suspected when the ability for respiration is reduced out of proportion to the general muscular power of the individual.

Practically, the subject naturally divides itself into two divisions, the curative and the prophylactic uses of deep breathing. I will not say a great deal under the first head, hoping that men who have had far more experience than I will give us their views freely. In looking over the recent journals one finds many references to deep breathing, but in the text-books which I consulted very little was said. I only noted one reference in a text-book, and that was in Professor Gilman Thompson's "Practical Medicine" (p. 275). The general opinion of the profession seems to be that full inflation of the lungs and expansion of the chest is a good thing for consumptives, except when fever or hæmorrhage is present; although there are writers who advocate it all through the treatment, without reference to fever, and say that it does no harm. A number assert that the chief advantage which comes from inhalations of medicated vapours is due to the deep breathing which they cause.

Some advise inhalations very moderately and carefully made, while others are less particular as to the methods to be observed. Certainly it would be an excellent thing if this Society could take an authoritative position on this important question and advise the profession whether or not deep breathing should be practised by consumptives generally, and if so, could lay down positive rules as to the method of

its application, and the limitations to be observed. The rule that any patient with a fever should keep quiet is well enough known to the profession, and even to the laity, but as I have said above, very little seems to be generally known in regard to the uses and abuses of deep breathing.

The Nordrach system of treatment for consumption, as opposed to the Dettweiler system, advocates much exercise in addition to fresh air and superalimentation; whereas the latter system enjoins rest in the open air and superalimentation. Undoubtedly deep breathing may do harm if injudiciously employed. If it were not capable of injurious application it would stand unique amongst all medicaments and therapeutic devices known to our art. In addition to its use in consumption various references were noted advocating deep breathing in other diseased conditions, as, *e.g.*, Jacobi (15), Musser (16), Vergely (28), Talma of Utrecht (14), strongly advocate its regular employment in asthma, pointing out that a marked characteristic of asthmatics is their shallow breathing. Daland (15) speaks of it as an adjuvant in the successful treatment of heart disease. Anders (17) says that the abnormal respiratory conditions in sufferers from obesity have not been sufficiently studied. Their pathogenesis is not clear, but the mechanical embarrassment from the deposition of fat throughout the body will largely account for them. He states that he has found the average chest expansion in obese subjects to be less than 2·5 inches, and says it is evident that such interference with lung expansion must excite dyspnœa after muscular exercise or over-distension of the stomach, and even during recumbency. Unquestionably here is another vicious physiological circle. Indolent and shallow breathing causes suboxidation with resulting obesity, and obesity is a prominent cause of dyspnœa on exertion. This latter condition fosters inactivity both mental and bodily, and so the whole economy suffers from malassimilation, delayed metabolism, &c. Certain subjects suffering from some inflammatory or obstructive conditions of the nose, throat or lungs, have been observed to become obese, as sufficient oxygen cannot be inspired to

properly aerate the blood and burn up the waste, and consequently fat accumulates in the tissues (18).

Diabetes (21), another disease of suboxidation, ought to be largely benefited by deep breathing. Although I found a number of references to the benefit of muscular exercise in this disease, I found no special reference to the effect of deep breathing upon it. It is a noteworthy fact in this connection that 25 per cent. of diabetics die of phthisis pulmonalis (27). In cholelithiasis Dr. Robert Gasser (19) recommends regular deep-breathing exercises. He denies the infective origin of gall-stones and deprecates operation, insisting that a hygienic method of life will prevent their formation.

Douty (22) proves that syphilis is amenable to open-air treatment and exercise, as well as tuberculosis, and this accords with the opinion of Professor George H. Fox, of New York, who said in the writer's hearing that the proper way to handle a syphilitic was to train him, as if for a prize fight.

Dr. Ingersoll reminds us that spinal curvature is also a diseased condition which can be prevented if treated in its first stage by gymnastic and deep-breathing exercises, but upon which medicine will have no effect.

As to the prophylactic aspect of pulmonary gymnastics, every authority that I have been able to consult, who takes the pains to consider the prophylaxis of phthisis, recommends it. Knopf urges that every child should be taught deep breathing as soon as he is strong enough and sufficiently intelligent to learn it. It is needless to add that I entirely agree with him. Deep breathing seems to be pretty thoroughly taught now as an essential part of many, if not all, good gymnastic courses, but so far as it is taught in schools it seems to amount to little, and to have little if any permanent effect upon the scholars.

In a recent editorial in the *Lancet* (20) the ground is taken that no system of education is complete that does not educate the body as well and as thoroughly as it does the mind. Those educators who have given the subject sufficient thought, are largely willing to acknowledge the justice of this position,

but no adequate means for carrying out these suggestions have so far been adopted, at least so far as I can learn, in any part of the United States.

Some steps have, it is true, been taken in this direction, but not much good will be accomplished until thoroughly trained medical men shall have charge, not only of the hygiene of the schools, but of the physical education of every scholar, and regular examinations of physique, vital capacity, lung development, &c., shall be held, and as is now done in some of the high and normal schools, the pupil must pass in these important branches before he or she shall be promoted, just as he or she must now pass in their studies. In other words, in proper physiological education the bodily functions shall be educated as being equally or more important to the child's future well-being than the mental.

You will tell me that athletic sports are increasing and doing much good. So they are. But these sports fail to benefit those most needing physical education, and they are sometimes hurtful, and cannot be relied upon to develop all the bodily functions symmetrically. They are not begun early enough to benefit the little children, and would not be safe perhaps for them. They scarcely affect the large masses of girls and boys that we especially wish to build up and fortify against consumption and other illnesses, and fit for their work in life. Let us strike for a thorough, rational and properly carried out physical education. Hitchcock (29) has said, "There is no doubt that if as much care were bestowed on our young in seeing that this particular part [the thorax] was developed with that care that the brain receives, tuberculosis would almost disappear."

Scheidt (23) says that "the foundations for a healthful and useful life are laid between the seventh and fifteenth years, and never afterwards." McLean says (24), after having described a system of pulmonary gymnastics, "If the phthisical patient would live and be healthy he *must work for it*, in the way I have indicated, or by some similar method, or he will miserably perish, notwithstanding he may swallow all the

drugs in the dispensatory and be injected with all the serums and specifics, so-called, which are now obtainable."

Dr. Van Weissmayer says (26), "In the education of the people lies the great hope of prophylaxis." M. Georges Demery says (25), "The essential of physical education is voluntary motion."

How, then, shall we sum up this well-meant, albeit somewhat disjointed, paper? I offer the following conclusions :—

(1) Deep breathing is essential to good health, and is in many cases a valuable therapeutic measure.

(2) Its importance is not at all generally appreciated.

(3) It should be a part of every child's education.

(4) It is especially indicated for backward and sickly children.

(5) The profession owes it to itself to study more deeply this vital question and to be able to instruct the laity fully upon all its bearings.

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HOW TO POSTPONE THE DEGENERATIVE EFFECTS OF OLD AGE.

By Dr. J. MADISON TAYLOR.
PHILADELPHIA, PA.

A review of the phenomena of advancing years points clearly to the line upon which these may be in part controlled or delayed. It is not to be expected that we can secure the co-operation of most, or indeed many, people, in pursuing preventive measures. If that were possible, and when it is possible, great things can be accomplished. However, certain principles obtain here which should be outlined, so that whosoever may see fit to do so can follow these suggestions to his advantage. It will be found that those who have studied this subject most carefully agree that normal bodily exercises are not to be forbidden, but rather encouraged. *Per contra*, if bodily activities are not pursued there must inevitably follow much more rapid retrograde changes in all the tissues. In respect to the diet, it is universally admitted that after middle life the amount of food taken should be less than before that time, and the changes in the diet should be rather to use less of the structure-forming material, though not always to exclude them. Again, there should be used relatively little, indeed, as little as possible, of stimulating articles of food, which make more for acceptability than necessity. In short, the simple rule should be observed of eating no more than a perfectly normal appetite craves, and as little as possible of those things taken solely because they are agreeable. As the period of old age is reached, by which is meant about 70 years, the regimen should be markedly simplified and always taken with the greatest deliberation. A general rule is recognised to obtain in most cases, that the more nearly the diet is reduced to bread and milk and fruits the longer will the person live and enjoy good health. It must be borne in mind, however,

that exceptions will occur, and where the strength is being rapidly lost from any cause it is wise to increase the variety and encourage food taking until the strength is restored to the normal for the age reached. The digestive processes, as well as all the processes, are slower in advancing years. Some persons can get along best with long intervals between feedings; others, the majority, do better by taking small amounts of food at short intervals. The evacuations appear lacking in activity, and must be encouraged but not forced by purgative or strongly diuretic drugs. This is best met by suitable articles of diet, bulky and yet not calculated to produce fermentative change. This quality is found in fruits, nuts, cereal compounds and salads. Probably the best drink is buttermilk, which seems to have a salutary effect on the action of both the bowels and the kidneys. Next comes koumyss or zoolak, upon which I have known some elderly folk to subsist almost entirely for years. It is easily made at home, and can be thus supplied fresh and sound, and is within the reach of all, poor as well as rich. Of the cereals, Indian meal is in some respects the best, either in the form of bread or porridge. The question of the red meats must be studied with regard to the peculiarities of the individual, but they are needed very little, usually not at all. Of fluids, these are best taken in abundance. but where the heart is weak it is not wise to take much before exercise, as at this time they throw a perilous strain on the cardiac structure. Medicated waters are oftentimes useful, but the less inorganic drugs enter into the system the better. The habit of constantly using lithia salts, exerting as they do a certain form of irritation, is to be condemned. If arterio-sclerosis is present the vaso-dilator drugs are useful, also the solvents of the calcium chloride, especially in the forms of natural mineral waters. The care of the skin is of paramount importance, and the first desideratum is to employ systematic and thorough rubbing and brushing of the surface from head to heel. The flesh brush or mitten made of coarse towelling used by the patient for half an hour at a time, night and

morning, serves many admirable ends, and is better than too much bathing. A good plan is for the patient before rising to employ this skin stimulus thoroughly while in the recumbent posture ; if preferred and he is strong enough, it is better done while sitting. The skin of old age tends to become harsh, rigid and dry, and after this effleurage it is well to rub into the body a certain amount of some oil, and it will be found that the skin will take up thus sometimes an enormous quantity. Olive oil is perhaps best, but preparations containing lanolin are excellent, especially if it is desired to increase the weight and aid accumulations of fat. Sometimes I have found crude petroleum useful where stimulation of the surface is desired. If the skin be hypersensitive, thought must be given and changes advised in these procedures until the skin becomes inured to the full amount of mechanical stimulus. Old people are sensitive to cold, because their surface resistance is lowered and their heat-producing powers waning. The tendency shown by many to stay indoors and keep themselves over-protected and over-clothed is a grave error. This habit should be overcome gradually but firmly, and they should be in the open air as much as possible and the clothing used sufficient but never too much. This is particularly true of underwear, which should be light and porous, preferably linen next to the skin, and can be supplemented by extra woollen underwear placed over this to vary with the conditions of the temperature. Outings are essential to encourage free oxygenation through the lungs and the skin. Chill of surface is much more likely to follow exertion where too much or too heavy underwear is used, and the results are far more serious than if there is too little. If the skin be leaky, becoming readily moist on exertion, excessive precaution must be used lest secondary chill follow. If the underwear is made damp by exercise it is important to change this as soon as possible and whenever it is produced.

The most important specific recommendations I wish to offer for the postponement of the degenerative effects of age and for the recovery of so much of the normal vigour as is

possible in each, have to do with the forms and qualities of the exercises. As has been shown, the tendency of the tissues in advancing age is toward a steady and irretrievable hardening or stiffening or loss of elasticity, due to normal or abnormal increase in the connective tissue. The results of these are seen not only in the rigidity of the spinal column and ligaments, the skin, the muscle sheaths, the structures of the blood vessels, the parenchyma of the great organs, &c., which are obvious enough, but the really disastrous effects are those brought about by this xerosis upon the organs concerned in the processes of nutrition and of the special senses. This point I do not see brought out in any literature which has met my eye. Let me illustrate thus: We have as age creeps on a loss in cellular activity in the functions of the special senses, well shown for example in dimness of vision, loss of hearing and slowness of cerebration. Much of this is inevitable and must continue. Some of this, however, can be delayed almost indefinitely. It will be observed that the tissues about the neck of an old person exhibit conspicuous loss of elasticity, so markedly that oftentimes dense rigidities are present, especially in the nuchal region.

I have been surprised and gratified to find that regulated movements of the neck and upper truncal muscles employed for the purpose of accomplishing something else, resulted in a conspicuous improvement in hearing, in vision, in cerebration, and as a consequence in the betterment of cerebral circulation, also in sleep. Following this thought I have repeatedly been able to promise, and fulfil the promise, that an individual who had suffered impairment in these particulars should enjoy distinct improvement by employing regulated movements.

What is true of these structures is equally true of the abdominal viscera. A large proportion of the digestive disturbances, even of those in earlier middle life, is due to a relaxation in the supporting tissues of the great organs of the abdomen. It is estimated that dilatation, and letting

down of the stomach, will be found in 60 per cent. of all adult persons. Oftentimes there are no symptoms indicating this, but when present they point towards a series of disturbances, resulting from loss of muscular quality in the stomach itself. In those whose abdominal walls are feeble the organs have a tendency to sag and droop. This produces a series of alterations in the relationships of the organs, and particularly of the blood vessels and the structures concerned in their function. In the case of the kidneys, whose support is largely through the vessels which enter and leave them, and whose shape is so nearly spherical that they move readily, the suspensory tissues are not seldom twisted, thus shutting off the passage of waste material and interfering with the actions of the nerves to the extent sometimes of causing pain and suppression of the function. In females this tendency to ptosis falls seriously upon the genito-urinary cycle, hence the uterus and ovaries are thrown out of their normal adjustments. In women who have borne children the abdominal parietes have all suffered more or less overstretching, and the slackening of these supporting tissues works more or less mischief and discomfort. In some men, too, this is experienced. It becomes conspicuous where faulty attitudes are added to the structural defect. I have elsewhere expressed my opinions more fully on this and offered suggestions for relief (*Philadelphia Medical Journal*). These visceral ptoses are recognised as of large significance, and their remedy is a matter of increasing importance. It can be seen at a glance that misadjustments of the abdominal organs require attention, sometimes to a very pronounced degree. The first means of relief sought by women is by the use of various forms of the corset. This garment is so universally used that we are compelled to accept it as a necessity, although I am of the opinion that we could get along very well without it, if it were possible to bring women to believe so. However, the main thing is to induce women to use those corsets which will do least harm. A certain amount of harm inevitably must follow the use of a needless arti-

ficial support. The walls of the abdomen should be competent to support the contained viscera. Where these walls are notably defective they should be supported artificially only until they can be trained to do the work adequately for which they were constructed. It is an axiom that all artificial support is merely for the purpose of conserving function until the tissues can be brought back to the normal. The first thing to be acquired in getting rid of these defects is to teach the person to stand correctly and continue to maintain proper attitudes under all circumstances. Wherever there is a stooping attitude maintained without effort at holding the abdominal organs in place voluntarily, there is a tendency for the abdominal viscera to pour out over the brim of the pelvis, which is thus necessarily in a slanting position.

If the neck-bone is held straight, the ribs well lifted, and a moderate degree of tension exerted upon the abdominal walls, the viscera will rest upon, and within, the confines of the pelvis, and this position should be learned and practised; nor is it at all difficult if the attention is directed that way and some little familiarity acquired in maintaining the correct position. The body cannot be held in normal attitudes unless the skeletal muscles are in fairly good tone.

It will be obvious to anyone that those persons who habitually maintain an erect position in standing or sitting are stronger than those who stoop and slouch. It may be said that many of these last are perfectly well and strong, and it must be replied that they are not as well and strong as they should be; and, further, that their abdominal tissues are in perpetual danger, because any organ, or part of the body, which stands outside of its normal adjustment comes closely to being in the relationship of a foreign body, and cannot be so well protected by the central nervous control mechanism. Again, the position of the organs in the thorax subject them to less danger than those of the abdomen, because they have a well constructed box to dwell in, but nevertheless they, too, are exposed to a good many perils if out of alignment.

A person who stoops and allows the shoulders to sag down and forward, and the ribs to fall back toward the spine, shortens the antero-posterior diameter of the thorax anywhere from two to three inches. It needs little demonstration to show that the lungs, heart, great vessels, and other important structures in the thorax cannot live, and move, and have their proper being, under such circumstances. Not only so, but prompt and adequate attention to these conditions will result in not only improving the general health, but also in maintaining symmetric functional action, and the postponement of senile changes in the connective tissue. In short, all these facts are rehearsed to give prominence to the conclusion, which seems to me inevitable, and abundantly demonstrated by data in my experience, that attention to proper attitudes, involving economies in interorganic relationships, is the one fundamental factor in postponing senile changes. The physiologic reason for urging care and persistence in retaining elasticity of tissues is to be found in the fact that sclerotic changes, and faulty attitudes, combine to interfere with peripheral vascular competence as well as peripheral innervation. To recur for a moment to the illustration used above, of the marked improvements following increased flexibility in the tissues of the upper thorax and neck, it is my opinion that this is to be brought about by thus promoting and encouraging fuller circulatory interchanges, especially of the lymphatic channels. I am also of the opinion that arterio-sclerosis is thus postponed, and sometimes prevented, hence the same principles hold good throughout the entire economy. It may not be necessary to develop this thought further, but to assume the truth of what I regard as an original observation, that systematised efforts at elasticising of the tissues are the basis upon which sclerotic changes generally can be delayed and made less. The means by which this result is to be attained consist chiefly in employing movements taught by a skilful person, and this should be the physician himself, assisted, it may be, by an expert.

trained by him to do the work in detail. Free exercises in the open air proportional to the capacities of the individual, are of the greatest importance, and should be regulated with the same care and supervised with the same conscientiousness as any other medical measures. Among those of the utmost importance are the prescribed movements, which differ in degree at least from the ordinarily employed remedial movements, whose main object is to improve muscular tone, and which are largely flexor for the arms, with only a moderate degree of extensor activities. For older people there should be a steadily increasing attention to the extensors of the arms and less action demanded of the flexors. First these should be passive in the form of stretchings, rotations and torsions applied to the limbs and trunk and neck. These should be moderately supplemented at first by voluntary movements in the same direction. Later, as the vigour improves, and the heart action is strengthened, and the blood vessels recognised to be better able to stand the increased vascular tension induced by exercise, these may be employed more forcefully, until, by and by, the patient, even when well advanced in years, can endure a degree of muscular work which is surprising. Not only so, but this results in a feeling of well-marked enjoyment not only of the results in improved circulation and in increased resistance to temperature changes, but in the procedures themselves, which come to be distinctly enjoyed. In this connection let me say a word about the senile heart. It is generally accepted in a fatalistic sort of way that old people are unfit for activities, that they must do as they are inclined to do, little or nothing but exist, like a vegetable. My own experiences and convictions in this particular seem fortified by the best authorities consulted. In my opinion the disinclination to movement and effort is rather the result of under-oxygenation, a habit, or other conditions which make for what one may almost call laziness, than an instinctive economic impulse. It is obvious that the healthier and happier old people are those who are reasonably active. It is my experience that where activities

have been encouraged, always with full estimation of the limiting conditions present, most improvement results. This is true, and demonstrated to be so, under circumstances which would ordinarily be considered prohibitive; for instance, where there have been observed those phenomena supposed to indicate threatened apoplexy, however that term be interpreted. I have had a number of cases under observation for many years where I was originally consulted for a train of symptoms which pointed towards cerebral changes such as vertigo, lapse of memory, sensory disturbances in hearing and sight, formications, paræsthesias, periods of brief unconsciousness, &c., in people of seventy years or more. Ordinarily the treatment advised for such conditions would be to reduce the individual to live the life of a hothouse plant. I have found in this contingency great practical advantage in attending to cutaneous elimination, especially by frictions, oilings, massage, passive movements. carried on to all full stretchings as described above, and gradual increments of stretching exercises, forceful extensions, and finally, free movements and open air life. Some of the individuals are now past eighty, strong and well. Even where there are found to be alterations in the kidneys, sometimes albumen, casts and sugar, the encouragement of peripheral vascular stimulus was followed by the happiest results. Above all, in the cardiac arrhythmias attention to the skin and regulated movements reduce these and sometimes cause them to cease. The pulse in old people, as has been said, is quicker than in middle life. The average of those cases reported by Humphrey, all of them over 80 years of age, was for men seventy-three per minute, and women seventy-eight, and the average respiration was seventeen. The proportion of regular to irregular pulse was four to one. I find irregularity in the pulse more commonly, indeed, it is generally present more or less, even in the healthiest. Humphrey also found in the majority of old persons examined little or no change in the arterial system. Clifford Allbutt makes the assertion that in many cases of extreme age no

evidence of arterio-sclerosis is to be found. One of the oft-recurring phenomena of old age is œdema, due to loss of vascular tone and defective lymph circulation. This condition would be much less frequent if the tissues, especially the larger muscles, were kept in a condition of elasticity. thus relieving direct pressure and occlusion of the contained avenues of circulation. The exhaustion after fatigue is not well recovered from in the aged, and hence it is not permissible to maintain protracted activities, and they should be supplemented by periods of rest, and if the heart be not strong this should be taken lying down ; but this is no reason to encourage complete inaction. Again, the change characteristic in the bones of the aged, their loss of weight due to diminution in size, the walls of the shaft becoming thinned throughout from within, especially toward the ends of the bones, as at the head of the femur, forbids strong muscular exertion such as lifting. Nor should activities be sudden and severe, otherwise there is danger that a false step and a fall may result in shock or fracture, or both. Nor is it important or desirable that the muscles should be kept at their full strength, even if it were possible. The quality of musculature is mainly desirable for purposes of oxygenation, and to maintain freedom from stiffness and the consequent compression upon blood-vessels and nerves. In short, the component parts of the machine in healthy old age are slowly and equally weakened. They respond imperfectly to ordinary calls, the centres failing less early than the outer parts ; but these same centres should be maintained at their best for so long as it is possible. Finally the wheels of the machine stop. This slow decline is really a beautiful spectacle, and requires for its fruition the sheltering influences of civilisation and sympathetic care. In the conditions of primitive society man died even as the animals and birds die, the weak by the hands of the stronger. When assailed by sickness or age, death came swiftly from one or another agency of Nature, usually from animal or man. In civilisation life can be conserved in-

definitely, or at least to well up toward the century mark, provided the aged persons exercise judgment in the manner of life lived, and if cut off before a reasonable time the fault lay within themselves or their circumstances. In this slower decline it becomes more possible for disease and decay to manifest themselves, but even here prevention is a large possibility. If the heart or the digestive organs be disproportionately vigorous they will overload and press the other organs, and one of these, the weaker one, will give way.

The use of inorganic drugs has little place in relieving the grave disorders of the old. When these are used in the form of the natural mineral waters they have, since time immemorial, been held in high esteem for more or less definite and indisputable good effects, the nature of which has never been satisfactorily explained. Modern studies on the physiology of the blood, especially of the serum, help to account for this, Recently Trunecek, of Prague, has announced a method of treating the phenomena of arterio-sclerosis which has been not only successful but suggestive, and seems to me to throw light on the value of some mineral waters which will prove a rich field for research. His thesis is that certain salts can be introduced into the blood current which shall aid in dissolving the calcium phosphate found in the structure of the sclerosed vessels. Hence he adopted the plan of throwing into the circulation direct, by hypodermoclysis or intravenously, a strong solution of sodium phosphate and magnesium phosphate, which are found normally in blood serum but only in minute quantities. His followers have obtained gratifying results, and many modifications are made of his original solution. Leopold Levi used this by the bowel and the mouth, and it was found that the latter gave just as good effects. He used for internal administration cachets of sodium chloride 10 grammes, sodium sulphate 1 gramme, sodium carbonate 0·40 gramme, sodium phosphate 0·30 gramme, calcium phosphate and

magnesium phosphate, of each 0·75 gramme, divided into cachets No. xiii.; of these two or more a day are given.[1]

Under this treatment the usual discomforts and evidences of disturbed circulation, such as dyspnœa, asthma, vertigo, angina pectoris and prostration rapidly lessened or disappeared, far better than by the use of iodides and nitrites, although it occasionally happened that when these last were also used the progress was more satisfactory.

It occurred to me to review the analysis of the various mineral waters, and I was surprised to find how many of them exhibited likewise many of these ingredients, in varying proportions, along with one or other factor to which the virtue of the water was chiefly attributed. Hitherto these factitious items have been regarded as indifferent, or to them has been attributed various hypothetic or conjectural reasons. We have been long recognising that the use of certain of the alkaline waters lessened the acidity of the urine, and presumably of the blood, and the laity have been taught, partly by the profession, but chiefly by the manufacturing chemists and the public press, that if ever the demon of uric acid can be laid, by the ingestion of enough of lithia salts or some of the new and wonderful substances, the special products of the factory, their imperilled lives can be saved and most ills removed. The reaction against this notion has set in, but the fad remains, and will prevail long among the people, and the non-reading of the profession, that alkalies are helpful in a vast variety of vague states, accompanied by the output of uric acid in the urine common to about one-fifth of the community. The real point of effort should be the restoration of the functional activity of the liver, which has to do with the conversion of ammonium cyanate, uric acid, and other end-products into urea.

This is to be accomplished in a number of ways, the basis of which is to bring about bettered circulation in

[1] I use these subdivided into twenty with better effect.

the liver and more complete functional power. There may be, and it seems that there is, considerable efficacy in the use of natural mineral waters which exhibit a reasonable proportion of those salts which exert a solvent action, lime salts or other adventitious substances. Drugs, however, serve a temporary purpose, and in such conditions as the discomforts arising in beginning degenerated processes of age would seem to need an indefinite continuance. The real curative remedy and defensive measure is in aiding oxidation of the tissues by all rational means, special movements, and stimulation of the vasomotor mechanism of the great eliminating organs.

THE SYPHILITIC AFFECTIONS OF THE HEART AND AORTA.

BY LEONARD WEBER, M.D.
NEW YORK CITY.

MR. PRESIDENT AND GENTLEMEN,—It was in 1895 that I had the honour of reading a paper on "Syphilis as a Factor in Diseases of the Heart and Lungs" before this Association. The literature of syphilis of the heart has grown very considerably since that time, and there have been so many publications of carefully observed cases that there is no further doubt among the well informed as to the frequency of its occurrence in the later stages of syphilis. When Fournier and Erb, in the seventies of the last century, called the attention of the profession to the frequency of the disease of the nervous system attributable to the toxins of syphilis, their observations were soon corroborated by other clinicians, and it was not more than ten years thereafter that this highly important knowledge became the common property of not only the neurologist, but the general practitioner as well. Thanks to the labours of Virchow, Heubner, and many others, we have learned and are now convinced of the fact that syphilis may be counted as rather frequent among the various causes of arterial degeneration. in the form of sclerotic and gummatous processes, leading to endarteritis obliterans, with its baneful influence upon the nutrition of the parts supplied by the diseased vessel. Forty years ago this was not known, and the heart, of all organs, was looked upon as practically exempt from syphilis. Now we are recognising that sclerosis of the coronary arteries, softening and degeneration of the cardiac muscle, observed in persons under fifty, are often of syphilitic origin; and it will not be long, I believe, before physicians in general will admit syphilis of the heart is not infrequently seen in persons who have or have had syphilis.

In considering the etiology and general pathology of

cardiac syphilis, the first question which would present itself is this: Is there a predisposition on the part of certain luetic patients, so that they are more apt to develop cardiac syphilis than others? In a paper read before the New York Academy of Medicine, published in the *New York Medical Record*, April 5, 1884, on "Syphilis and Locomotor Ataxia," by which the discussion of the interesting subject was started and kept up for a number of years in various medical societies in the country, I showed that of 125 cases of syphilis treated by me, and observed for a period of from fifteen to twenty-five years, there were but two which presented marked symptoms of specific disease of the brain (hemiplegia) and died of it, and that these were two men who for one reason or another could not be convinced that they had syphilis, and unfortunately abandoned treatment during the first year of observation. Not one of the whole number had tabes. It is much the same, probably, with cardiac syphilis. In the first place, then, a light case of syphilis, overlooked, not treated at all perhaps, or an ordinary case of syphilis treated in a perfunctory way, or not long enough, or when properly treated, becoming mixed up with alcoholism, is apt to develop nerve or visceral syphilis in the course of time, sometimes not until many years after infection. Again, it is a matter of frequent observation, and I have notes of some cases confirming this, that by the neurotic taint, inherited or acquired by prolonged masturbation, or excess in venery, alcoholism, unusual physical stress and exposure, the syphilitic is predisposed to specific and degenerative changes of the nervous system; but similar influences may not as regularly produce similar results with reference to cardiac syphilis, and it will be shown by the history of a few cases that the vigorous has as little guarantee against coronary sclerosis and its baleful sequelæ as the feebly constituted syphilitic. Gout and lead poisoning may run alongside with syphilis, producing their own lesions without influencing that disease in the direction of arterio-sclerosis in any noteworthy way. There is, for instance, the case of M. C., 54, with hereditary gout, a free liver, vigorous,

married rather too soon after acquiring syphilis, wife died some years ago, showing signs of contamination; his son had hereditary syphilis. Now this man has had many attacks of gout in the last twelve years, during which he has remained free of all specific symptoms, but heart and arterial system do not yet give any appreciable sign of disease.

Whether there is any particular occupation predisposing the infected to specific heart disease more than any other I cannot say, but will mention that the two most marked cases of specific disease of heart and aorta which have been seen by me, concerned shoemakers, the younger of whom died suddenly the other day, while the older man is still alive, and much improved by treatment.

It has been stated that in the course of tabes dorsalis, aortic insufficiency is occasionally seen to develop. That is true, but not in the sense that posterior sclerosis produces the disease, but that it is caused by the syphilitic virus so often associated with tabes. Having carefully watched the development of aortic disease, including valves in old syphilis, and without the presence of any other marked influences, I am convinced of the correctness of the above statement. I also believe that I am able to show now a causal connection between the syphilitic toxins and certain cases of chronic diffuse and interstitial nephritis dependent upon arterio-capillary sclerosis of the kidney.

What do we find at the autopsy of a syphilitic heart or aorta? At the outset, let me repeat what I said in a paper on this subject, read before the New York Academy of Medicine, March 9, 1899, and published in the *New York Post-Graduate Journal*, May, 1899: "Excepting the gumma in the cardiac muscle or cardiac arteries, there is nothing in the appearance of the sclerotic changes of the vessels, nor in the softening and degeneration of muscular fibres, that would enable us to distinguish the arterial sclerosis of syphilis from that made by other diseases." And it is even so with "Pulmonary Syphilis in the Adult," *vide* the excellent monograph under that title by Drs. Th. E. Satterthwaite

and W. H. Porter, published in the *Boston Medical and Surgical Journal*, June 11 and 18, 1891, wherein it is shown that the white pneumonia s.o. alone presents specific appearances. Read the essays on cardiac syphilis by Mracek, *Archiv für Dermatologie und Syphilis*, 1893, vol. xxv., Is.; Adler's observations on cardiac syphilis (*New York Medical Journal*, October 22, 1898); and on arterio-sclerosis in the *New York Medical Record*; and another paper by the reader on arterio-sclerosis and chronic nephritis in the *New York Post-Graduate Journal*, April 15, 1898; and so on down to Professor Runeberg's recent *résumé* of the subject in *Deutsche Med. Woch.*, 1903, Nos. 1 and 2, and you will find that at a time when neither the aorta nor the main trunks of the coronary arteries exhibit any signs of disease, endarteritic and periarteritic processes may be developed in and about the smaller vessels of the heart, leading to structural changes later on.

The case develops further, and we notice atheromatous patches in the aorta, pulmonary and coronary arteries; under the microscope, endo- and peri- arteritis and interstitial myocarditis pretty well advanced. In another case, again, with the symptoms of enlargement, weakness and arrhythmia of heart and dyspnœa during life, the dilated heart will show areas of softening (myomalacia) in the myocardium, streaks and patches of fibrous growth replacing muscular fibres; occasionally also a gummatous tumour. Again, when the symptoms have been those of angina pectoris alone, coarse lesions of the main trunk of the coronary artery only may be found after the sudden death of the sufferer. I may mention here the unusual case of a man, aged 45, who died some time ago of acute pulmonary œdema during an attack of ordinary bronchial catarrh in midsummer. He had had syphilis some twenty years before that, and the autopsy revealed extensive atheroma of the pulmonary artery extending a way out into the ramifications of the vessel.

Through obliterating endo- and peri- arteritis, distension of capillaries and smaller veins occurs sometimes, and in addition

thereto small hæmorrhages take place, the extravasated blood forcing the muscular fibres apart and breaking them into fragments, as shown first by Ehrlich. To be sure, hæmorrhagic infarction is not the usual way in which myocardiac tissue is destroyed, but it is through deficient blood supply that the fibres undergo atrophy and molecular disintegration, and that scar tissue is formed in their place by simple cellular infiltration; and replacement of numerous muscular elements by fibrous tissue means *permanent impairment of vital function.* This has an important clinical bearing, for it is evident that proper therapeutic measures may arrest further developments of morbid cell-proliferation and gummatous growths and produce absorption, but are powerless against fully-developed fibrous tissue. The fact, then, is now established that, wherever structural lesions are found in the cardiac muscle, due to syphilis, there also typical alterations in the blood-vessels can be made out; and there is good reason to believe that myocarditis and subsequent degeneration are secondary to the vascular lesions.

Diagnosis.—In the absence of syphilitic stigmata in a given case, it will be almost impossible to arrive at a correct diagnosis at an early stage of the disease. The differential diagnosis will also be difficult, particularly when the patient is unwilling or unable to give a satisfactory history of previous luetic disease. By careful attention to details in our examination, and *ex juvantibus* when other means fail, we shall not infrequently make the diagnosis of syphilitic lesions pretty certain.

Leaving the purely senile heart, which has a literature of its own, out of consideration altogether in this paper, it is evident that in endo- and myo- carditis from rheumatism, in the alcoholic, the nicotine, the fatty, the gouty heart, syphilis may, as a rule, be excluded, though it may occasionally complicate one or the other of these forms of heart disease. The signs of myocarditis in individuals below fifty, such as weak impulse, with accentuated second sound, a rhythmic

action, tachycardia, or even bradycardia, faintness, dyspnœa on exertion, angina pectoris, general depression and weakness, should always arouse our suspicion of syphilis, whether the patient admits a previous infection or denies it. In the absence of any other satisfactory etiology, we are justified to assume syphilis, and try to arrive at a correct diagnosis by specific treatment. The signs of active syphilitic lesions in other parts of the body in a case of myocarditis would go far towards making the diagnosis certain. The treatment may fail to cure, as it will in a case of advanced fibrous degeneration ; that does not disprove the syphilitic nature of the case : it may be too far advanced to yield to treatment.

Dr. Semola contends that arrhythmia and tachycardia, without other functional disturbances, not clearly to be accounted for on other grounds, and not yielding to the ordinary treatment with digitalis or other cardiac remedies, are pathognomonic of cardiac syphilis ; and he reports a number of such cases cured by iodide and mercury, after other treatment had failed.

The clinical and anatomical material is as yet insufficient to decide to what extent his views are borne out by actual fact. However, Isaac Adler, Wm. Thompson, and myself reported such cases to the New York Academy of Medicine in 1898 and 1899.

Quite a number of cases of sclero-gummatous disease of the coronary arteries manifest themselves mainly by the symptoms of angina pectoris. Professor Runeberg, of Helsingfors, states that a case of this kind, going on without cardiac hypertrophy and other symptoms of general arteriosclerosis, occurring in a patient under fifty, is of specific origin—at least eight times out of ten. When not relieved by proper treatment, sudden death during an attack is not a rare event.

Next to specific sclerosis of the coronary arteries in frequency and practical importance must be placed syphilitic aortitis, with its sequelæ, degeneration of the semilunar

valves, and aneurismatic dilatation. These affections of the aorta will be associated with cardiac hypertrophy and muscular degeneration also, particularly so where the valves are much diseased. Two very good examples of this kind I shall mention later on. The anatomical lesions found here are rather gross, and generally more readily recognisable as specific sclero-gummatous processes than those of the coronary arteries. Other influences being excluded, the differential diagnosis is more readily made when the aortic disease concerns a person under fifty years of age, just as we know now that the majority of cases of aortic aneurism present a previous luetic history. Of my own records of about a dozen cases of aortic aneurism, syphilis had been present in ten of these. Circumscribed gummata in the cardiac muscle are but rarely observed in comparison with arterio-sclerosis and myocardiac degeneration. Where far-advanced, obliterating arteritis is disclosed at the autopsy of a syphilitic heart, so that a small size knitting needle only can be pushed along a coronary artery, and we know that, nevertheless, the patient had but few symptoms during life indicating serious cardiac lesions until he rather suddenly succumbed to a fatal attack, we can readily understand that a patient in the early stage of specific coronary sclerosis may present no symptoms whatever to indicate the presence of a dangerous disease. And is it not even so in renal sclerosis and in endarteritis obliterans generally?

In the great majority of cases which have so far come under my observation, I have had pretty well-marked signs of cardiac disease before me; but the heart can get along pretty well through its blood supply, and muscular force may be reduced; and provided we succeed in arresting further progress, and cure by specific treatment what may yet be curable, the prognosis is not so bad as it looks at first sight. Old cases may not be cured, but they can be readily improved, if they respond to treatment. I remember but one case concerning a young man with well-marked constitutional syphilis

of recent date, with febris continua syphilitica, enlarged spleen, marked anæmia, and endo-myocarditis, who got entirely well after mercurial inunctions, followed by the iodides and tonics, and has remained so these last four years. But this was a case of specific cardiac disease in the early stage, and in a young person.

To rely upon the iodides alone in the treatment of syphilitic heart disease will lead to disappointment, according to my experience; temporary improvement, often very good, you may get, but it will soon pass away. Not so, however, if mercury be used with them, or even without them, provided the patient's kidneys are sound. Then and then only will good and even permanent results be obtained in treating cardiac syphilis. For this purpose I have been in the habit of ordering mercurial inunctions whenever practicable; when not, the bichloride of mercury hypodermically, or the biniodide by the mouth. Advanced cases of syphilitic aortitis I have found less amenable to treatment than specific cardiac disease. The general nutrition of such patients is almost always much impaired, and the various specifics are not well borne.

Finally, permit me to give you the history of four rather interesting cases:—

Case 1.—Alb. M., 67, father and mother lived to a good old age, and had always been well. Though a free liver and smoker, he was never ill until he contracted syphilis in 1877. He was carefully and sufficiently treated, and kept under observation for six years. There have been no relapses or manifestations of tertiary lues. He remained quite well and active until October of last year, when he noticed his breath getting short on slight exertion, his sleep disturbed and uncertain, and his throat and trachea often filled with catarrhal secretions. The superficial dulness of heart occupied a somewhat increased area, impulse diffuse and weak, first sound poor, followed quickly by accentuated second sound, heart pause shortened, arrhythmic, no murmurs.

Marked sclerosis of radials, no angina symptoms. There seemed to be no doubt about the presence of chronic myocarditis having reached a stage at which the cardiac functions began to show serious disturbance. The question arose, was it all due to old syphilis, or also—perhaps even more so—to arterio-sclerosis of advanced age, and the influence of liquor and tobacco? Tentatively, mixed treatment was ordered and carried out for four weeks, and an evening dose of digitalis was given; but the heart dimensions remained the same, the subjective symptoms improved but little. In December he experienced an acute attack of gastro-intestinal indigestion after eating some too rich or spoiled food. The patient had high fever for three days, on recovery felt very weak, and had lost all appetite; presently he became dropsical, the water increasing with alarming rapidity, filling his legs, abdomen, and appearing in the pleural cavity, and the urinary secretion dwindled down to 15 ounces in twenty-four hours. He had lost all appetite, was somnolent, without being able to sleep; had, in fact, all symptoms of venous back pressure caused by rather acute dilatation of the right half of an already damaged heart. Specific treatment, calomel, strychnia, and moderate doses of fluid ext. digitalis failing utterly to afford relief, I said to myself: Leave all previous history out of consideration, and treat the case as one of acute incompensation, such as we observe sometimes in mitral regurgitation, when the right heart becomes over-distended. Of an infusion of the best English leaves of digitalis (ex. ʒss.) ℥vi., liq. potass. citrat ℥i., tinct. columbo ℥ss., he began to take a tablespoonful every three hours on a Wednesday (noon), and in the night from Friday to Saturday he passed of urine 90 ounces. The re-established and increased diuresis kept right on, and after finishing a second bottle of the same mixture in the course of the next five days my patient was not only safe, but practically well enough to go about. To this day, four and a half months having passed, he has been able to attend to business regularly; his pulse,

though good enough, continues arrhythmic, and his heart needs careful supervision, because it is, and will remain, the seat of chronic myocardiac weakness and degeneration.

CASE 2.—Ad. M., aged 68, married, father of healthy children, stout and active man; have known him these forty years. He never had any of the usual signs of syphilis, and would never admit he had it if I told him so to-day; but, fortunately for his welfare, I noticed a well-marked superficial serpiginous syphilide over sternum about thirty-five years ago, when I happened to examine his chest. Eight years ago he came to me with well-marked symptoms of general neurasthenia, sense of heaviness and fatigue, somnolence, &c., patellar reflexes greatly reduced, pupils almost inactive, slight Romberg present. By a systematic course of hydrotherapy and rather perfunctory mixed treatment, repeated at appropriate intervals, he improved greatly, and had no occasion for further medication until three years ago, when he came back and complained of dyspnœa, fulness in epigastrium, loss of appetite, weakness, &c., &c. Finding the heart enlarged in all dimensions, arrhythmic, small, jerky, fast pulse, and a greatly enlarged liver, he was first put on calomel for the purpose of unloading viscera; this was done once a week for four weeks, with very beneficial results in all respects. After that he took mixed treatment in moderate doses for fifteen days out of every month, and continued this for one year. His liver returned to almost normal dimensions, cardiac dulness much reduced, the progress of chronic myocarditis has been stopped, but, to be sure, no cure is to be expected. Digitalis has not been used in this case, though I tried it—and about a year ago—to reduce the size of enlarged heart, but without any success whatever. Of great assistance in this and like cases are occasional purges by calomel or elaterium to relieve passive congestion, and help thereby the action of such specific and other drugs as may be indicated.

CASE 3.—Mark M., aged 63, married, shoemaker, had syphilis between his twentieth and thirtieth years, which soon became latent. Fifteen years ago he suffered from suppurating muscular gumma in the leg, which I scraped thoroughly with a sharp spoon. Under iodoform dressing and mixed treatment perfect healing took place. Last winter he came back, complaining of cardiac symptoms. Heart somewhat enlarged, first aortic murmurish, ascending aorta dilated, slight angina symptoms, probably due to some coronary sclerosis and myocardiac degeneration. Cardiac pulse weak, pulse arrhythmic, some œdema of lower extremities, slight albuminuria. By a course of iodide of potassium, strychnia, and nitroglycerin, rapid amelioration of all symptoms was obtained, œdema and albuminuria disappeared, and patient is in fairly good condition at the present time.

CASE 4.—Joseph K., aged 37, married, shoemaker, father of healthy children, had syphilis when he was twenty-two, but knew of no more specific symptoms after twenty-five until about two years ago, when he was taken with severe neuralgia in left side along the course of about the seventh intercostal nerve. At various dispensaries and in hospitals also he received treatment. When he appeared at my clinic last October he was thin, pale, and worn, complaining of above pain mainly, and was in generally poor condition. By the fluoroscope the physical diagnosis of dilatation of heart and aorta was confirmed, there was muffled first aortic sound of aorta, and an almost filiform pulse at left radial. Sacculated aneurism of descending thoracic or arch of aorta could be excluded after repeated examinations, and the diagnosis confined to sclero-gummatous disease of ascending aorta, and associated with disease of coronaries and myocardium and syphilitic periostitis, and neuritis concerning left seventh rib and intercostal nerve near the spine. After a carefully conducted course of mercurial inunctions plus iodide of potass., his pains left him, and patient was able to

work again at his trade, which he had not done for two years. During the summer he was put on tonics, and he kept on doing well until December of last year, when his heart became weak again, general nutrition suffered, his intercostal pain returned, and angina pectoris symptoms occurred. Some improvement was had again after the iodides and cardiac tonics; but in March of this year the patient died rather suddenly during an attack of angina pectoris.

BRITISH BALNEOLOGICAL AND CLIMATOLOGICAL SOCIETY.

GENERAL Meeting held at 20, Hanover Square, W., on Wednesday, May 18, 1904, Dr. ALFRED STREET, President, in the Chair.

The SECRETARY (Dr. Sunderland) read the Minutes of the previous meeting, which were confirmed.

On the motion of the PRESIDENT, Dr. Clippingdale and Dr. Leon were appointed scrutineers of the ballot for election of Officers and Council.

At a subsequent stage the PRESIDENT announced that the Officers and Council as proposed in the ballot papers had been unanimously elected.

The following candidates were elected Fellows of the Society :—

R. Allan Bennett, M.B.Lond., M.R.C.S. Saltburn-by-the-Sea.
David Walsh, M.D.(Edin.), L.R.C.P., L.R.C.S.(Edin).

The following candidates were nominated for ballot at the next ordinary meeting :—

W. Francis Somerville, M.A., B.Sc., M.D., Glasgow.
John Deloraine Michie, M.B., B.S. (Melbourne), Bognor.
Henry C. MacBryan, L.R.C.P., L.R.C.S., Bath.
Alexander Milne, M.B , C.M., Ilkley.
Alex. Gardner Lacey, L.R.C.P., M.R.C.S., Ascot.

Sir Hermann Weber was elected the Honorary President of the Society in succession to the late Sir Edward Sieveking.

The SECRETARY read the following Report of the Council :

The Council have pleasure in presenting to the Fellows of this Society a Report on the work and progress made during the ninth session.

Six meetings have been held, three in the afternoon and three in the evening, and on all occasions have been well attended. The President, Dr. Alfred F. Street (Westgate-on-Sea), has fulfilled the varied duties of his office with great

devotion and distinction. He took as his Presidential Address, "Some Questions in Seaside Climatology," which proved of great interest to those present.

Papers have been read by Dr. Chalmers Watson (Edinburgh), on "The Pathogenesis of Gout"; by Dr. Solly, on "Tangier," and by Dr. Hedley, on "Physical Therapeusis: a Rapid Review." An interesting discussion on "Some Aspects of Obesity" was introduced by Dr. Leonard Williams, in which a large number of Fellows took part, and was adjourned to a subsequent meeting, when it was re-opened by Dr. William Bain (Harrogate). To-day Sir Dyce Duckworth will give an address entitled "Observations on British Winter Resorts."

It is with profound regret that the Council have to report the death of Sir Edward Sieveking, who had occupied the position of Honorary President of the Society since its foundation, and whose advice and assistance were of immense value in its early days.

The Society has also lost by death the valuable services of Dr. Ivor Murray, a past President, and of Mr. Alfred Haviland, and Dr. George Watson (Tunbridge Wells), both Vice-Presidents of the Society. Mr. Haviland's name and work will long hold a place in medical literature on account of his researches concerning the geographical distribution of disease.

Fifteen new Fellows were elected during the session, and the total number of Fellows is at present about 386. It is hoped that the Fellows will put forward the objects of this Society to those of their friends interested in the subjects of balneology and climatology, so that the roll of Fellows may be largely increased during the ensuing session.

The various railway companies have been approached on the subject of getting a reduction in fares for all Fellows coming to town to attend a duly convened meeting of this Society, but the result of the enquiries was in every case unfavourable.

The question of holding an Annual Provincial Meeting has been again carefully discussed by the Council, and the matter is still under consideration.

The Fellows have been recently requested by a circular post-card to state their preference for afternoon or evening meetings, and the Council having taken into consideration the replies, have decided to hold four meetings in the afternoon and two meetings in the evening, during the next session.

In conclusion, the Council have to congratulate the Society on the fact that Sir Hermann Weber has kindly consented to act as Honorary President of the Society.

Dr. MOXON (Matlock) moved the adoption of the Report. With regard to the proposal to hold provincial meetings, personally he did not consider that would be a very great convenience. The means of access to London were probably as easy, and the transmit was as rapid, as to any part of the country, and, speaking personally, he would prefer to attend a meeting in town to one held in the provinces.

Dr. FREDERICK GARDNER (Bournemouth) seconded the motion, which was carried unanimously.

On the motion of Dr. LEON the auditors were re-elected.

Dr. SNOW proposed that the Secretary should have power to appoint an auditor in the event of either of those elected refusing to act.

This was agreed to.

Sir DYCE DUCKWORTH, M.D., LL.D., F.R.C.P., then gave an address entitled "Observations on British Winter Resorts."

Sir HERMANN WEBER characterised the lecture as an admirable synopsis of the climates of the winter resorts of England as compared with those abroad. He understood that Sir Dyce did not shut out the hope of a very great improvement taking place with regard to the winter conditions of English resorts, by means of good hotels supplied with winter gardens, well lighted, well ventilated, and well heated, with open verandahs made so as to revolve, in order that patients might spend the greater part of the day in the open air, even in bad weather. In proposing a vote of thanks to Sir Dyce for his most interesting address on a most important subject, he was sure that everyone would agree that they owed a debt of gratitude to him for bringing the matter before them in the way that had been done.

The PRESIDENT said that he gladly availed himself of the opportunity of endorsing the sentiments which had fallen from Sir Hermann Weber. It was twenty-five years or more since he sat at the feet of Sir Dyce Duckworth as one of his pupils, but perhaps Sir Dyce would recollect that at that time he used to worry him a good deal with questions. If he thought it would be in order upon the present occasion, he would very much like to worry him with more questions upon his exceedingly interesting and suggestive address; but under the circumstances his plain duty was simply to second the vote of thanks and then sit down.

Dr. BURNEY YEO said that whenever he went South he either met Sir Dyce Duckworth or heard that he had just left. He knew, therefore, how well Sir Dyce was capable of comparing the health resorts in the South with those possessed by this country. He had earnestly hoped that the lecturer would have informed them of some charming place in this country where one could be free from the humidity which was the bane of our winter climate, and also free from the perpetual hideous motor-car and the alarming motor-cycles which, even in London, made the streets scarcely comfortable. One great advantage in obtaining such a resort in this country, either along the coast or inland, would be that it would save them that great fatigue which was inseparable from visits to the distant South. He had returned from the South about a month previously, and had had such a very unpleasant experience in regard to crowded carriages and being turned away from hotels, that if he could find a suitable place in which to spend a month or two in the winter in this country he would be very loth to go so far away again. Another unpleasant acquaintance he had met with, which one might meet with again, was influenza, which was exceedingly prevalent in the resort where he spent some part of the winter. The explanation given was that those places were resorted to very greatly by Russians, who not only brought themselves, but their microbes. That was comforting, because the Russians were not likely to come to our own winter resorts. He could corroborate Sir Dyce in one observation particularly, viz., that

the climate in the South of France and in Egypt, especially the latter, had changed considerably of late years. That statement was founded on truth and rested on recent observation. Only a few weeks ago a lady who had been 1,200 miles beyond Khartoum, informed him that on coming back to Alexandria she had had to put on the very warmest clothes she had ever put on in her life. All were very anxious to find suitable winter resorts in this country, and he had no doubt that the excellent address of Sir Dyce would encourage enterprising and energetic efforts to discover the most suitable places for invalids in the winter.

The vote of thanks was carried by acclamation.

ANNUAL DINNER.

The Annual Dinner took place on Wednesday, May 18, at the Criterion Restaurant, the President, Dr. ALFRED STREET, in the Chair. Fifty-seven Fellows and guests were present, and Sir Dyce Duckworth and Sir Hermann Weber (the newly-elected Honorary President of the Society) were entertained as guests by the Society.

Dr. WM. V. SNOW (Bournemouth), Chairman of Council, proposed the toast of "The Guests," to which Sir Dyce Duckworth made an agreeable response.

The toast of "The Society," coupled with the name of the President, was proposed by Sir HERMANN WEBER, and acknowledged by Dr. ALFRED STREET.

Sir HERMANN WEBER, in the course of his remarks, said that he regarded it a great honour to be asked to give the toast of the "British Balneological and Climatological Society," for he considered it one of the most practical and most useful medical societies of England. It had already, he said, done very good service, and would render further great services towards the development of the numerous and varied health resorts of the United Kingdom. No other country, he maintained, could bear comparison with England with regard to the splendid seaside resorts of the different coasts, offering great varieties of climate on the east and west and south coasts, and its islands. The inland health resorts and mineral

waters, too, were of great importance ; splendid improvements had already been effected within the last ten years, and further improvements would follow in the near future. The fact that his neighbour, Dr. Street, was the presiding medical genius of Westgate, reminded him of his friend, the late Sir Erasmus Wilson, who might be called the founder of Westgate as a health resort, who had been a universal practical genius and had taken a great interest in spas and health resorts. Sir Erasmus had often expressed to him his regret that English health resorts were so much neglected and were so much in want of social attractions. He would have been delighted if he could have witnessed the foundation and the working of this Society and the progress made at almost all the English health resorts. He expressed the hope that even in winter, although the sunlessness was a great drawback, many health resorts would, in course of time, be rendered useful and enjoyable by the establishment of winter gardens, of airy and well-lighted large halls in hotels, enlivened by music and other social attractions. He therefore asked the company to wish success to the British Balneological and Climatological Society.

ENTERTAINMENT BY THE PRESIDENT.

At the conclusion of the dinner the President, Dr. Street, received the Fellows and guests in the King's Room and entertained them at a Smoking Concert, which was largely attended and highly appreciated by the audience. A vote of thanks was then passed to the President for his generous and pleasant hospitality.

Reviews and Notices of Books.

Handbook of Climatology. By Professor Dr. Julius Hann, of Vienna. Part I., General Climatology; translated with the Author's permission, by Robert de Courcey Ward, Assistant Professor of Climatology in Harvard University. (London: Macmillan and Co., 1903.)

The first edition of Professor Hann's *Handbuch der Klimatologie* appeared in 1883. In the second edition, which was issued in 1897, the work had been expanded into three volumes, and it is a translation of the first of these volumes which lies before us. The translator explains that there is no intention of going beyond this volume, which deals with general climatology, and is complete in itself. The other two volumes are taken up with special climatology, and it has been found impracticable to translate them.

The fact that up to the present there has been no reliable text-book on the subject may to some extent explain, though it cannot excuse, that absence of instruction in climatology in the medical schools of this country which we all deplore. The work before us supplies such a text-book, and we wish we could persuade ourselves that its appearance would lead to anything like a general realisation of the importance of the subject. Certainly nothing could be better calculated to bring about such a realisation. The work is well and simply arranged, its bulk is small, and the translator has performed his task so admirably that no trace of the original German construction is anywhere discernible. And the matter is no less excellent than the manner. All the questions are discussed in simple language, and the explanations and definitions are lucid in the extreme.

The first part is taken up with a consideration of the climatic factors: temperature, humidity, winds, and the like, and very sufficient and instructive it is. Of special excellence is the second chapter, in which are discussed the important and interesting questions which centre round humidity.

In the second part all that which concerns general climatology is adequately dealt with, *e.g.*, solar climate, the influence of land and water upon the distribution of temperature, the other factors, such as continents and ocean currents in modifying and determining climates, periodic variations, and so on. Each section is clear and succinct, setting forth the present state of our knowledge in a style which is engaging as well as informing.

Of course, climatology is not an exact science, and the authors are careful to point out the limitations which our ignorance imposes upon us. In their hands, however, the subject assumes a very definite shape, and it is to be hoped that the advance which this book represents will stimulate others to work in the same field. The book, it should be understood, does not concern itself in any degree with the medical or therapeutic aspect of the question; it is climatology pure and simple. But then, if anyone wishes to employ climates scientifically for remedial purposes, his practice must be based upon a knowledge of the questions with which this book deals, and such an one could not employ his time better than by studying its pages. It is a book which no one interested in climatology can afford to be without.

THE THERAPEUTICS OF MINERAL SPRINGS AND CLIMATES. By I. Burney Yeo, M.D., F.R.C.P. (Cassell and Co., London, Paris, New York and Melbourne, 1904.)

This book is an old friend revivified and brought up to date under a new title. The author has long been known as one of our leading English climatologists, and the value of his work in this direction is universally esteemed. Of the monuments to his industry and originality that which has been most widely read is the volume entitled "Climate and Health Resorts," the last edition of which appeared in 1890, and was soon exhausted. The book before us is substantially the same volume, remodelled, and in some parts rewritten, so as to include the advances which have been made since it last appeared. The change in the title has been effected with a view of bringing the present volume into line with the other works on the subject of therapeutics with which the author has enriched medical literature. The size and print remain the same as before. This is wise, for neither could have been bettered. The book is the right size for rapid consultation, a use to which the matter admirably adapts it, and the printing is clear.

It would be a work of supererogation to say aught in praise of a work which has deservedly attained to such a popularity as this one, but one thing is quite certain, namely, that those who appreciate its merits in its older form will cordially approve of most of the changes which appear in the newer. Of "Climates and Health Resorts" it was legitimate to complain that, good as it was, it nevertheless lacked something in cohesion and completeness. Such a reproach could not be levelled against the volume before us.

The book is divided into two distinct parts, the first of which deals with mineral springs, and the second with climates. In each part the most important places are mentioned in the

text, but if any station fails to be so included, the main particulars concerning it are set forth in a footnote. We are not quite sure that we prefer this to the method of giving such details in the Index, which obtained in the last edition. But that is due merely to natural distaste for changes in old friends' features, and has no support either in logic or convenience.

To those of our Fellows who are unacquainted with this volume we say unhesitatingly that in neglecting it they are neglecting one of the best books on the subject which has so far appeared in any language, a book which is full of information attractively conveyed, and one which is pregnant with suggestiveness concerning the difficult problems which the subject presents.

Notes from the Spas and Sea-side Stations.

FOLKESTONE.

THE holding of the Congress of the Royal Institute of Public Health at Folkestone this summer has done much to bring Folkestone again into notice. The Institute issued to its members a charming and well-illustrated guide to the town and neighbourhood, consisting of some sixty-four pages. The guide is written by Mr. Smart, the editor of the *Folkestone Express*, assisted by the local committee of the Congress; this is typical of what a "guide" should be. Everything one wants to know about a place is there, and there is no padding or unreasonable stuff. It commences with a history of "Folkestone" from the Saxon times, and in seven pages reaches the visit of Queen Victoria, in 1855, to the Pavilion Hotel, the favourite resort of Dickens.

The town stands mainly on very high ground between two hills, but the foreshore, whose climate approaches nearly to that of the Riviera, reaches from the harbour to Sandgate, affording space for many handsome residences. The ornamental gardens and winding paths through the pine-trees on the face of the cliff, are delightful at all times of the year. The lifts afford ready access to that grand promenade, "the Leas," above, where, in the season, thousands of visitors congregate and listen to the bands, and enjoy the beauty and grandeur of the scenery, which calls to mind very vividly the lovely Bay of Naples. The coast of France, thirty miles away, is easily visible. The northern part of the town, containing the beautifully kept Radnor Park with its two lakes, has been extensively built upon of late years. The Cheriton Road, recently improved and converted into a broad thoroughfare, forms a junction by way of Cherry Gardens Avenue, with the newly laid out Boulevard, which runs at the foot of Cæsar's Camp and

Sugar Loaf Hill. Wide roads and pavements, in many cases intersected with grass plots and flower-beds, and generally bordered with trees, form the distinguishing features of Folkestone.

The "Guide" contains an interesting article on the sanitation, drainage and rainfall, by Mr. Nichols, the Borough Engineer, in which these matters are fully described. Owing to its high position, the sewerage is excellently managed. The sewers have two outfalls into the sea, which are iron pipes run out below low water-mark to the east of the harbour. All the houses have intercepting chambers with air inlets, ventilators and traps. The refuse is now most efficiently destroyed by a recently erected "Destructor." It is shortly to be collected by steam motor vans.

The Medical Officer of Health, Mr. Yunge-Bateman, contributes an article on the health of Folkestone. He considers the town well suited for those who are suffering from anæmia, scrofula and nervous debility. Owing to the freedom from dampness and fog there is a marked absence of acute rheumatism, and for the same reason convalescents from this and from diseases of the respiratory organs are much benefited. Children who are delicate and backward do remarkably well, as evidenced by the increasing number of well-filled private schools.

During ten years the mean temperature has been 49·8°; mean daily range, 10·7°; mean relative humidity, 81; rainfall, 26·64 inches; sunshine, 1850·6 hours.

The prevailing wind during summer and autumn is south-west. The climate of Folkestone is bracing and dry; the latter being favoured by the porosity of the soil. However hot the summer elsewhere, there are always sea-breezes here. The equality of its temperature is shown by the mean temperature for January being 40°. Owing to the general dryness of the ground, and much less heavy rainfall than at most places on the south coast, invalids are enabled to take exercise in the open, which would be denied them in places with a warmer but more humid condition of climate.

The average death-rate during the last ten years has been

13·5 per 1,000, and the infant mortality rate, 136·6. There is a fever hospital, and also a small-pox hospital.

The water supply is very good, and in no instance has any epidemic or outbreak of serious illness been traced to the water supplied by the waterworks company. An article on the waterworks is written by Mr. Alderman Spurgen, the chairman of the company.

Two recent additions to Folkestone have been great acquisitions. At the Pavilion Hotel, situated below the cliff near the harbour, has been erected an immense winter garden, where exercise and amusements can be had in all weathers, and the new Grand Hotel on the top of the cliff at the west end of the town has numerous "loggia" for its visitors. In these balconies with removable windows a fresh air cure, with every luxury that a modern hotel can give, can be carried out without discomfort in the coldest winters.

NOTES ON SOUTHSEA.

VISITORS to Southsea are often surprised when they are informed that they are on an island, which is, however, actually the case. The Borough of Portsmouth, of which Southsea is a part, occupies nearly the whole of the island of Portsea, Southsea occupying the whole of that portion of the island which faces Spithead and the Isle of Wight. Parts of it lie rather low, and consequently there is a tendency after heavy rain for some back-flooding in the roads which lie lowest. The Corporation are, however, now spending many thousands of pounds on relief sewers, which will, it is hoped, entirely obviate this nuisance.

The climate of Southsea is remarkably mild and equable, as the following figures show. The mean temperature for 1903 was 51·4°, with a mean range of about 10·5°. In the winter severe frosts are rare, and even in August the heat is tempered as a rule by cool breezes. The humidity (average for the last ten years) is 81·6. The rainfall, as over most of the country, was last year greatly in excess of the average, being no less than 35·18 inches of rain. The average for the last ten years

was only 26·5 inches. The mean daily sunshine for the past ten years is no less than four and a half hours, and for the three summer months it works out at nearly seven and three-quarter hours per day. The town has thus well earned its title of "Sunny Southsea." The prevailing winds are westerly and south-westerly, the town being well sheltered from the cold winds from the east and north. The death-rate in Southsea is remarkably low. Including the whole Borough of Portsmouth, the death-rate for 1903 was 14·75 per 1,000 per annum. For Southsea alone the death-rate for 1903 was only 8·9 per 1,000 per annum, in a population of about 18,000 persons. The population of the whole Borough was estimated in 1903 at 194,960.

There is an excellent water supply, derived from wells in the deep chalk near Havant. It is on constant service all over the Borough, about seven million gallons being sent into Portsmouth daily. The house drainage is well looked after, most of the lodging-houses having been inspected by the Health Department Inspectors. Good apartments are plentiful and extend all along the front.

From its climatic advantages Southsea is now almost as much a winter resort as a summer one. Having one of the largest dockyards in the world, and a permanent garrison, there is always a large service population, and many means of amusement during the winter months. The Dockyard is at all times a source of interest, there being always many large battleships, &c., building, or under repair. There are concerts on the old and new piers all the year round, and always a first-class company at the Theatre Royal. One of the chief attractions of Southsea as a health resort is found in its large open common, stretching along the front between the houses and the sea. The common is about a mile and a half in length, between the Clarence and the South Parade Piers. Eastwards a walk or drive can be extended about two miles, as far as the Hayling Island ferry, where there is a most sporting seaside golf course; and westwards from the Clarence Pier, past the saluting battery to the various objects of historical interest in old

Portsmouth. Amongst these may be mentioned the "Victory," (Nelson's flagship), the Corporation Museum, the old sally port, &c. One of the great attractions of Southsea is the excellent service of boats to the Isle of Wight and places of interest along the coast. Twenty minutes will take us over to Ryde, and about another twenty to twenty-five minutes to Cowes. In the summer, excursion boats also run to Shanklin, Ventnor, and round the Island, almost on every day in the week. There is an excellent service of municipal electric trams, rendering access to all parts of the town easy. Two railway lines run to Southsea, namely, the London and South Western, and Brighton and South Coast Railway, many trains doing the journey of 75 and 86 miles, respectively, in a little over two hours.

British Balneological & Climatological Society.

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1900 Atkinson, Miles H. C., M.D., M.Ch., 1, Newbold Terrace, Leamington.

1901 Aubrey, A. Reuben, M.D., M.R.C.S., The Nook, Weston-super-Mare. C. 1901.

1896 Bagshawe, Frederic, M.A., M.D., F.R.C.P., 35, Warrior Square, St. Leonards-on-Sea. C. and V.P. 1896-99, 1901. P. 1900-01.

1897 Bain, William, M.D., M.R.C.P., Shaythorpe, York Place, Harrogate. C. 1903.

1897 Bampton, A. H., M.D., M.Ch., Brookfield Wells Road, Ilkley-in-Wharfdale.

1897 Bangay, Richard, M.D., Blockley House, North Finchley.

1899 Bannatyne, Gilbert A., M.D., 21, Circus, Bath. C. 1900.

1901 Barnard, John Henry, M.D., M.R.C.S., Villa Mai, Monte Carlo.

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1900 Batterham, John W., M.B., B.S., F.R.C.S., Grand Parade, St. Leonards-on-Sea. C. 1901-1903.

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1902 GRIFFITHS, John, M.R.C.S., L.S.A., Llandrindod Wells.

1896 GROVES, Joseph, M.D., F.G.S., J.P., Glenmount, Carisbrook, Isle of Wight. C. 1901. V.P. 1902-

1897 GUILLEMARD, B. J., M.D., C.M., M.R.C.S., Aliwal North, Cape Colony.

1896 HABGOOD, Henry, M.D., L.R.C.P., Stafford House, Eastbourne. C. 1901-3.

1895 HALDANE, William, M.D., F.R.C.P., Viewforth, Bridge of Allan, N.B. C. 1895-1900. V.P. 1895-

1901 HALL, Octavius, L.R.C.P., L.R.C.S., D.P.H., 7, Clarendon Terrace, Stoke, Devonport.

1897 HANDS, Charles H., M.B., M.R.C.S., Glendalough, Totland Bay, Isle of Wight.

1896 HARBORD, Augustus, M.R.C.S., L.R.C.P., 36, Bedford Square, W.C.

1902 HARBURN, John English, L.R.C.P., L.R.C.S., Crescent View, Buxton.

1896 HARDWICK, Arthur, M.D., Prospect House, Newquay, Cornwall.

1896 HARSANT, Joseph George, The Hive, Exeter Road, Bournemouth. C. 1897-1900.

1901 HARTLEY, John, M.B., L.R.C.P., Lismore House, Buxton.

1897 HAVELL, C. G., L.R.C.P., M.R.C.S., Felixstowe. C. 1898-1901.

1903 HAWORTH, John T., L.R.C.P., L.R.C.S., Rutland Lodge, Filey, Yorks.

1900 HAWTHORN, C. O., M.D., M.R.C.P., 63, Harley Street, W.

1901 HAYWARD, John W., M.R.C.S., L.S.A., Western House, Whitstable.

1901 HEANEY, Fras. J. S., M.A., M.D., F.R.C.S., 3, Brighton Parade, Blackpool.

1897 HEDLEY, W. S., M.D., 8, Mansfield Street, W.

1900 HEMMING, John J., M.R.C.S., L.S.A., 2, Grosvenor Villas, Eaton Road, Margate.

1896 HERBERT, Alfred C., L.S.A., J.P., Southwold.
1902 HEWLETT, Wm. Hy., M.D., D.P.H., Wivenhoe, Essex.
1900 HILL, G. William, M.D., 26, Weymouth Street, W.
1896 HILLYER, W. H., M.R.C.S., Heathcote, East Grinstead.
1898 HIND, Harry, F.R.C.S., Blytheholme, Victoria Avenue, Harrogate.
1897 HOBHOUSE, Edmund, M.D., M.R.C.P., B.Ch., 36, Brunswick Place, Brighton. C. 1901-02. V.P. 1903.
1896 HOBSON, Lewis John, M.D., B.S., F.R.C.S., 30, Swan Road, Harrogate.
1896 HOLBECHE, Arthur O., M.R.C.S., L.R.C.P., Abbotsfield, Great Malvern. C. 1902-03. V.P. 1903.
1897 HOLLAND, James Frank, M.D., R.U.I., St. Moritz, Engadine.
1902 HOLLIS, Alfred, M.D., Tower House, Freshwater, Isle of Wight.
1896 HOSKER, J., M.R.C.S., Kirkleatham, Boscombe, Bournemouth. C. 1900.
1898 HOUCHIN, E. King, L.R.C.P., L.M., L.R.C.S., Ravensworth, Cranbrook Road, Ilford, Essex.
1897 HUNTINGTON, William, M.R.C.S., L.R.C.P., 43, South Street, St. Andrews, N.B.
1896 HUSKIE, David, M.A., M.B., C.M., Moffat.
1898 HUTCHINSON, Roger J., M.R.C.S., L.R.C.P., Lowside, Haslemere.

1895 INGLIS, Arthur Stephen, M.D., 5, Pevensey Road, St. Leonards-on-Sea. C. 1899-1901.
1895 INGLIS, John, M.A., M.D., 18, Cornwallis Gardens, Hastings. C. 1896-99. V.P. 1895-
1897 IREDALE, J., L.R.C.P., L.R.C.S., Mablethorpe, Lincolnshire.

1904 JAFFREY, Francis, F.R.C.S., L.R.C.P., 33, Nottingham Place, W.
1899 JAMES, Alexander, M.D., F.R.C.P., 10, Melville Crescent, Edinburgh.
1896 JOHNSTON, George F., M.D., M.R.C.P., 3, Montagu Place, Montagu Square, W.
1895 JOHNSTON, Thomas, M.D., M.R.C.P., Annandale, Ilkley. C. 1896-97.
1897 JOHNSTON, Wm. A., L.R.C.P.I., L.R.C.S.I.
1895 JONES, H. Shirley, M.R.C.S., L.S.A., Ravenstone, St. Andrew's Road, Droitwich. C. 1895-98. Sec. 1898-
1897 JONES, M. Handfield, M.D., 35, Cavendish Square, W.
1897 JONES, William Black, M.D., B.S., D.P.H., Llangammarch Wells, Breconshire. C. 1898-
1900 JOSEPH, A. Hill, M.D., Glanmot, Cantelupe Road, Bexhill-on-Sea.

1896 KEETLEY, C. R. B., F.R.C.S., 56, Grosvenor Street, W. T. 1896-99. V.P. 1899-
1896 KERR, J. G. Douglas, M.B., C.M., J.P., 6, Royal Circus, Bath. C. 1896- V.P. 1898-1900. P. 1901-02.

1895 KINGSBURY, George C., M.A., M.D., 1, Elm Court, Temple, E.C. C. 1895-98.
1898 KINGSCOTE, Ernest, M.B., C.M., 31, Lower Seymour Street, W.
1898 KNOTT, William, L.R.C.S., L.R.C.P., 1, Rycroft Street, Fulham.
1902 KNOWLING, Ernest Mansfield, M.B., B.A., M.R.C.S., North Bay View, Tenby.
1897 KROHN, Ronald E. S., M.D., M.R.C.S., Funchal, Madeira.

1904 LACEY, Alex. Gairdner, L.R.C.P., M.R.C.S., Sunninghill, Ascot.
1899 LARKING, Arthur E., M.D., M.R.C.S., D.P.H., 1, London Street, Folkestone.
1898 LAWRIE, Macpherson T., M.D., "Greenhill," Weymouth.
1899 LEIGH, John Dickinson, M.B., F.R.C.S., 7, Avenue Road, Scarborough. C. 1901-02.
1898 LEON, George A., M.A., M.D., D.P.H., Hillsdon, Sidmouth. C. 1899-1902. V.P. 1901-
1902 LEON, John Temple, M.D., B.Sc., D.P.H., Elmwood, Grove Road, Southsea.
1897 LETTERS, Patrick, M.D., D.S.M., D.P.H., Valentia Island, Co. Kerry, Ireland. C. 1898-1900.
1902 LEWIS, Ernest E., M.D., M.R.C.S., L.R.C.P., 30, Weymouth Street, W.
1895 LEWIS, Percy George, M.D., M.R.C.S., 22, Manor Road, Folkestone. C. 1902-
1901 LITTLE, James, M.D., F.R.C.P., 14, Stephen's Green, Dublin. C. 1902- V.P. 1901.
1897 LIVESEY, Edgar William, L.S.A., Alderney, Channel Islands.
1900 LORIMER, George, M.A., M.D., 9, Terrace Road, Buxton.
1896 LOVE, William, L.R.C.S.I., L.M., Manor House, Hoddesdon.
1896 LOWE, George May, M.D., F.R.C.P., 101, Alexandra Terrace, Newport, Isle of Wight.
1896 LOWE, T. Pagan, M.R.C.S., 16, Circus, Bath.
1900 LOWTHER, Richard, M.D., M.R.C.S., Fernleigh, Grange-over-Sands.
1898 LUFF, Arthur P., M.D., F.R.C.P., M.R.C.S., 9, Queen Anne Street, W. T. 1899-1901. C. and V.P. 1901-02.
1897 LYDDON, Richard, M.R.C.S., L.S.A., Cavendish House, Victoria Parade, Deal.
1899 LYON, Thomas Glover, M.A., M.D., M.R.C.P., 1, Victoria Square, S.W.
1896 LYS, Henry Grabham, M.D., Southbrook, Poole Road, Bournemouth.

1904 MACBRYAN, Henry C., L.R.C.P., L.R.C.S., Kingsdown House, Box, near Bath.
1901 MACDOUGALL, John A., M.D., 3, Rue Herman, Cannes.
1900 MACFIE, Ronald Campbell, M.A., M.B., C.M.
1897 MACINDOE, Alexander, M.D., D.P.H., Old Hayes, Sidmouth.
1897 MACKENZIE, A. L., M.R.C.S.I., 6, Brock Street, Bath.

1903 MACKENZIE, James, M.D.Edin., M.B., C.M., 68, Bank Parade, Burnley.
1895 MACQUEEN, Thomas, M.B., C.M., 10, Bolton Road, Eastbourne. C. 1895-1901.
1900 MAHOMED, A. G. S., M.R.C.S., L.S.A., Astolat, Bournemouth. C. 1902-
1899 MARSHALL, Augustine, M.D., L.R.C.P., 145, London Road, Lowestoft.
1896 MARSHALL, J. N., M.D., C.M., 7, Battery Place, Rothesay.
1895 MARTIN, Edward F., M.D., 7, Royal Terrace, Weston-super-Mare.
1897 MAY, William Page, M.D., B.Sc., M.R.C.P., Helouan, Cairo (November to April); 9, Manchester Square (May to October).
1897 McAULAY, Matthew, M.D., M.Ch., Kirkcubbin, Co. Down, Ireland.
1899 McCALMAN, Dove, M.D., Oban, N.B.
1897 McCANN, Frederick J., M.D., M.R.C.P., 5, Curzon Street, Mayfair, W.
1895 McCLURE, Henry, M.D., M.Ch., 36, Weymouth Street, W. C. 1895-01. V.P. 1899- C. 1903.
1895 McFARLANE, Alexander R., M.R.C.S., L.R.C.P., 27, Milner Street, Chelsea, S.W.
1897 McLAREN, Hugh, M.B., Ch., The Elms, Callender, N.B.
1896 MERRALL, H., M.B., Ch., Glen Eldon Road, St. Anne's-on-Sea.
1896 MERRICK, Horace T., M.B., Swiss Cottage, Surbiton.
1897 MERRICK, Robert W., M.D., 3, Palmerston Road, Dublin.
1904 MICHIE, John Deloraine, M.B., B.Sc., Bell Rock, Bognor.
1904 MILNE, Alexander, M.B., C.M., The Grove, Ilkley.
1897 MILNER, Vincent, M.B., C.M., Oak Lodge, Parkstone, Dorset.
1897 MINTER, L. John, M.D., M.R.C.S., L.R.C.P., 36, Sillwood Road, Brighton. C. 1902-
1901 MITCHELL, R. Pryce, M.D., M.R.C.S., Villa Henri, Monte Carlo.
1896 MOLLOY, Leonard, M.A., M.D., 3, Brighton Parade, Blackpool. C. 1903.
1898 MORISON, Alexander, M.D., F.R.C.P., 14, Upper Berkeley Street, W.
1896 MOUILLOT, F. A., M.D., B.A., B.Ch., Eton House, Harrogate. C. 1902-
1896 MOXON, A. H., M.R.C.S., 44, King Street, Great Yarmouth. C. 1896-97.
1895 MOXON, William, M.D., M.R.C.S., L.R.C.P., West View, Matlock Bridge, C. 1895-1900. V.P. 1900-02.
1899 MUIRHEAD, Claude, M.D., F.R.C.P., 30, Charlotte Square, Edinburgh.
1897 MUNRO, Seymour H., M.D., L.R.C.S., Nantwich.
1902 MURRAY, Gawler, L.R.C.S., L.R.C.P., 38, Gladstone Street, Scarborough.
1901 MURDOCH, Andrew, M.B., C.M., 24, Albert Road, Bexhill-on-Sea.
1897 MUSGRAVE, C. B. Thomas, M.D., M.R.C.S., L.R.C.P., The Cottage, Lifton, N. Devon. C. 1899-01.

1896 MUSPRATT, Chas. D., M.D., B.S., F.R.C.S., Tantallon, Madeira Road, Bournemouth.
1895 MYRTLE, Andrew S., M.D., J.P., F.R.S.Ed., Harrogate. C. 1895-99. V.P. 1895-96. P. 1897.

1899 NAYLOR, Rupert George, L.R.C.P., L.R.C.S., Smythesdale, near Ballarat, Victoria, Australia.
1902 NEWELL, Percy, L.R.C.P., L.R.C.S., 36, Eversley Road, Bexhill-on-Sea.
1896 NEWINGTON, H. Hayes, M.R.C.P., M.R.C.S., The Gables, Ticehurst.
1901 NICHOLLS, John Michael, L.R.C.P., M.R.C.S., Penwyn, St. Ives, Cornwall.
1902 NIGHTINGALE, Percy Athelstan, M.D.Ed., 5, Hertford Street, Mayfair, W.
1900 NOBLE, Stanley, M.D., M.R.C.S., L.R.C.P., 1, Montpelier Terrace, Brighton.
1898 NOURSE, Stuart, C.M., M.R.C.S., L.R.C.P., Hurst Villa, Jackson Road, Clacton-on-Sea.

1902 ODDIN-TAYLOR, Gordon E., M.R.C.S., L.R.C.P., Thuxton House, near Attleborough, Norfolk.
1897 ODELL, William, F.R.C.S., Ferndale, Torquay.
1896 OLIVER, George, M.D., F.R.C.P., M.R.C.S., Harrogate (June to October); Riversleigh, Farnham, Surrey (November to May). C. 1897-1901. V.P. 1897-
1895 ORWIN, Arthur W., M.D., 15, Weymouth Street, W. C. 1895-99. V.P. 1899-
1902 OWEN, John Morgan, L.R.C.P., M.R.C.S., Fishguard, R.S.O., S. Wales.
1897 OZANNE, Frederick N., L.R.C.P., M.R.C.S., Sheep House, Harrogate.

1896 PARDINGTON, Geo. Lucas, M.D., L.R.C.P., M.R.C.P.Lond., Glynlee, Tunbridge Wells.
1900 PARKER, Robert D., M.A., M.D., Caledon, Cape Town, S. Africa.
1896 PARSLOE, Henry, M.R.C.S., L.R.C.P., 5, Buckland Terrace, Plymouth.
1895 PEARSE, William H., M.D., M.R.C.P., 1, Alfred Place, Plymouth. C. 1895-96.
1901 PECHELL, Major Sir A. A., M.B., C.M., Culverton House, Alton, Hants.
1900 PINKERTON, Charles, M.D., 6, Queen's Road, Southport.
1900 PLANT, James Robert, L.R.C.P., M.R.C.S., 8, Boon Place, Plymouth.
1895 POLLARD, Reginald, M.B., M.R.C.S., 8, Higher Terrace, Torquay. C. 1895-1900.
1900 POPE, F. M., B.A., M.B., M.R.C.P., 4, Prebend Street, Leicester.
1896 POPE, H. Campbell, M.D., 280, Goldhawk Road, Shepherd's Bush, W.

1899 POPE, Percy, M.D., L.R.C.P., M.R.C.S., 74, Mortimer Street, W.
1902 POWELL, O. E., M.D., Fontenelle, Jersey.
1896 POWELL, Sir Richard D., Bart., M.D., F.R.C.P., 62, Wimpole Street, W. H.V.P.
1896 PRINCE, J. Perrott, M.D., M.R.C.S., Durban, Natal. C. 1897-1900.
1897 PRITCHARD, Owen, M.D., M.R.C.S., 41, Gloucester Square, Hyde Park, W.
1898 PRUEN, Septimus T., M.D., M.R.C.S., Sherborne Lodge, Cheltenham. C. 1899-

1903 RANKIN, Guthrie, M.D., F.R.C.P., M.R.C.P., 4, Chesham Place, Belgrave Square, S.W.
1897 RANKING, John E., M.A., M.D., F.R.C.P., 18, Mount Ephraim Road, Tunbridge Wells. C. 1899- V.P. 1901-
1895 RAWLINSON, Fredk. J., F.R.C.S., Stuart House, Bognor.
1902 REID, Douglas A., M.D., M.R.C.S., L.S.A., 12, The Norton, Tenby. C. 1903.
1900 RENDALL, Stanley M., M.D., M.R.C.S., Les Palmeiros, Mentone (winter); Hotel Thermal, Aix-les-Bains (summer).
1896 ROBERTS, Francis, L.R.C.P., M.R.C.S., Church Road, Forest Hill, S.E.
1897 ROBERTS, Frederick T., M.D., F.R.C.P., 102, Harley Street, W.
1896 RODEN, Percy A., M.B., Frear Street, Droitwich.
1901 ROSSITER, George F., M.B., M.R.C.S., Cairo Lodge, Weston-super-Mare.
1901 ROUSE, Rolla, M.D., Winter Palace, Monte Carlo.
1899 RUSSELL, George, M.B., C.M., J.P., Claremont House, Oudtshoorn, S. Africa.
1899 RUSSELL, William, M.D., F.R.C.P., 3, Walker Street, Edinburgh.

1901 SANDERS, Gordon, M.D., C.M., Villa Nina, Cannes.
1897 SANDWITH, Fleming Mant, M.D., M.R.C.P., Cairo, Egypt (January to April); and 31, Cavendish Square, W. (May to December).
1896 SANSOM, Arthur E., M.D., F.R.C.P., 84, Harley Street, W.
1899 SCLANDERS, Alexander, M.D., 2, Academy Street, Nairn.
1896 SCOTT, John Walter, L.R.C.P., L.M., M.R.C.S., Highfield, 126, Tulse Hill, S.W.
1899 SCOTT, Thomas B., M.R.C.P. and S., Aldington, Poole Road, Bournemouth.
1901 SELKIRK, John, M.A., M.B., C.M., Boston Spa, Yorkshire.
1896 SHARPE, William Cecil, M.D., C.M., Smedley's Hydropathic Establishment, Matlock.
1903 SHAW-MACKENZIE, A. C., L.S.A.Lond., Overstrand, Cromer, Norfolk.
1896 SHAW-MACKENZIE, J. A., M.D., 42, Green Street, W.
1902 SIKES, Arthur Walker, M.D., M.R.C.P., F.R.C.S., 40, Argyll Road, Kensington.
1901 SIM, Roderick, M.R.C.S., L.R.C.P., Villa Ciro, Monte Carlo.

1900 SIMPSON, W. J. Ritchie, M.D., 14, Gloucester Place, W.
1896 SIMPSON, W. S., M.R.C.S., M.R.C.P., Heslington House, Worthing.
1902 SMYTH, Wm. Johnson, M.D.Ed., The Hydro, Bournemouth.
1896 SNAPE, Ernest, M.D., 41, Welbeck Street, W.
1900 SNELL, Sidney H., M.D., B.S.(Lond.), Glenshee Lodge, Wandsworth Common.
1895 SNOW, William V., M.D., F.R.C.P., 2, Richmond Gardens, Bournemouth. C. and V.P. 1895- P. 1897-98.
1896 SOLLY, Ernest, M.B., L.R.C.P., Strathlea, Coldbath Road, Harrogate. C. 1896- V.P. 1901-
1904 SOMERVILLE, Wm. Francis, M.A.. B.Sc., M.D., Tyrefield House, Wilson Street, Hillhead, Glasgow.
1896 SPICER, Scanes, M.D., 28, Welbeck Street, W.
1897 SPILSBURY, Francis J., L.R.C.P., L.R.C.S., Hogsthorpe, Lincolnshire.
1896 STARTIN, James, M.R.C.S., 15, Harley Street, W.
1898 STEPHENSON, Sydney, M.D., M.R.C.P., F.R.C.S., 33, Welbeck Street, W.
1895 STIELL, Gavin, M.B., 54, Elms Road, Clapham Common, S.W.
1896 STOCKER, W. W., M.R.C.S., L.R.C.P., 253, High Road, Willesden Green, W.
1896 STREET, Alfred F., M.A., M.D., D.P.H., Burghfield, St. Mildred's Road, Westgate-on-Sea. C. 1897- V.P. 1901- P. 1903.
1897 SUMPTER, W. J. Ernley, L.R.C.P., Sheringham.
1895 SUNDERLAND, Septimus, M.D., M.R.C.P., 11, Cavendish Place, Cavendish Square, W. Hon. Sec. 1895-
1897 SWINHOE, George Rodway, M.R.C.S., L.R.C.P., New Swindon, Wilts.
1902 SWORDER, Ernest G., M.B., L.R.C.P., West Terrace, Folkestone.
1900 SYMES, Ernest, M.R.C.S., L.R.C.P., Craigmore, West Street, Scarborough. C. 1903.
1902 SYMONS, H. B. Trehane, L.S.A., L.R.C.P., Trevalga, Lansdown Parade, Cheltenham.
1900 SYMONS, William Henry, M.D., D.P.H., Guildhall, Bath.

1897 TAYLOR, James A., M.B., C.M., Dunkeld, N.B.
1897 TELLET, Frederick S., L.R.C.P.I., Auburn House, Ramsey, Isle of Man.
1897 THOMAS, Abraham, M.B., M.R.C.S., L.R.C.P., 22, North Parade, Aberystwith. C. 1897-
1895 THOMAS, Arthur W., M.D., "Carmelita," Crabton Close Road, Boscombe, Bournemouth.
1896 THOMPSON, E. Symes, M.D., F.R.C.P., 33, Cavendish Square, W. H.V.P. P. 1902-03. C. 1903.
1896 THOMPSON, G. H., L.R.C.P., M.R.C.S., 1, High Street, Buxton. C. 1900-2. V.P. 1903-
1902 THOMPSON, Henry E. Symes, M.A., M.R.C.S., L.R.C.P., 33, Cavendish Square, W.
1901 THOMSON, Herbert C., M.D., F.R.C.P., 34, Queen Anne St., W.

1896 THOMSON, Robert, M.D., Ivydene, Sweyn Road, Cliftonville, Margate. C. 1900-01.
1897 THOMSON, St. Clair, M.D., F.R.C.S., 28, Queen Anne Street, W. C. 1901-02.
1898 THORNE, W. Bezly, M.D., 2, Harley Street, W.
1898 THORNE-THORNE, Leslie, M.D., B.S., 45, Inverness Terrace, W.
1896 THURSFIELD, Thos. William, M.D., F.R.C.P., J.P., Selwood, Beauchamp Square, Leamington. C. 1896-98. V.P. 1896-
1904 TINLEY, William Edwyn, M.D., M.R.C.S., L.R.C.P., Hilvegard House, Whitby.
1895 TOLLER, C. W. E., M.D., Castle House, Ilfracombe. C. 1895-1902.
1897 TOWNSEND, R. H., M.B., B.A., M.R.C.S., Queenstown, Ireland. C. 1897-8.
1897 TURNER, William, M.A., M.D., Gibraltar.
1896 TYSON, W. J., M.D., F.R.C.P., 14, Langhorne Gardens, Folkestone. C. 1896-1900. V.P. 1899-

1896 UNDERHILL, T. H., M.B., C.M., 54, Dulwich Road, Herne Hill, S.E.

1902 VISE, Christopher, M.D., M.R.C.S., 39, Mount Pleasant Road, Tunbridge Wells.

1898 WADDELL, Arthur R., M.D., C.M., Potters Bar, Middlesex. C. 1901-03.
1903 WALSH, D., M.D., L.R.C.P., L.R.C.S., 18, Hanover Street, W.
1896 WAINWRIGHT, Lennox, M.D., L.R.C.P., 113, Sandgate Road, Folkestone.
1898 WALKER, A. W. H., M.D., L.R.C.P., Argylle House, Harrogate.
1897 WALKER, Henry Roe, M.R.C.S., L.R.C.P., 8, Harley Street, W.
1896 WALSH, Leslie, M.R.C.S., L.R.C.P., 21, Gay Street, Bath.
1897 WALTERS, F. Rufenacht, M.D., M.R.C.P., F.R.C.S., Crooksbury Sanatorium, Farnham, Surrey.
1896 WARD-HUMPHREYS, G. H., M.R.C.S., L.R.C.P., 26, Charles Street, St. James's, S.W. C. 1896-
1897 WARNOCK, Hugh T. A., L.R.C.P., F.R.C.S.I., Donegal.
1902 WATSON, Bertram, M.D., M.R.C.S., Mont Laurel, Walker Road, Harrogate.
1899 WATSON, Charles Robert, M.D., L.R.C.P., 5, Mount Ephraim Road, Tunbridge Wells. C. 1901-
1899 WATSON, D. Chalmers, M.B., M.R.C.P., 22, Coates Crescent, Edinburgh.
1900 WATSON, G. T., M.A., M.B., F.R.C.S., 47, Mount Ephraim Road, Tunbridge Wells.
1900 WATSON, Wm. Crawford, M.D., Beech Villa, Ripon Road, Harrogate.
1902 WEATHERLEY, Lionel Alex., M.D., C.M., M.R.C.S., Bailbrook House, Bath.

1897 WEBER, Frederick Parkes, M.A., M.D., F.R.C.P., 19, Harley Street, W. C. 1901.
1904 WEBER, Sir Hermann, M.D., F.R.C.P. Hon. President.
1899 WEIR, Archibald M., L.R.C.P. and S., St. Giles, Malvern Link.
1899 WELLESLEY-GARRETT, A. S., 187, Queen's Gate, S.W. C. 1902.
1899 WHITBY, Charles, M.D., Oldfield Park, Bath. C. 1900-
1897 WHITE, Charles P., M.A., M.B., M.R.C.S., 22, Cadogan Gardens, S.W.
1896 WHITE, Edward Alexander, M.A., M.D., 5, Upper Marine Terrace, Margate. C. 1896-98.
1900 WIGMORE, J., M.D., R.U.I., 26, Green Park, Bath.
1899 WILKINSON, John, M.D., M.Ch., D.P.H., Woodville, Droitwich.
1896 WILKINSON, Percy J., F.R.C.S.Ed., 10, Hillside Mansions, Highgate, N.
1897 WILLIAMS, Charles R., M.B., C.M., Ivanhoe Terrace, Ashby-de-la-Zouch.
1901 WILLIAMS, Chisholm, F.R.C.S., 20, Bedford Square, W.C.
1898 WILLIAMS, Cyril J., L.R.C.P., L.R.C.S., Brook Side, Woodhall Spa. C. 1900-01.
1897 WILLIAMS, John Robert, M.B., Bryn Hyfryd, Penmaenmawr.
1896 WILLIAMS, Leonard, M.D., M.R.C.P., 8, York Street, Portman Square, W. C. 1898-1901. V.P. 1901-
1896 WILLIAMS, Neville, M.A., M.D., Sydenham House, Harrogate.
1897 WILLIAMS, Owen, L.R.C.P., L.R.C.S., Bronheulog, Burry Port, Wales.
1897 WISE, A. T. Tucker, Montreux.
1896 WOHLMANN, A., M.D., Rotorna, New Zealand.
1896 WOODS, J. F., M.D., 29, Queen Anne Street, W.
1896 WYER, Otho, M.D., M.R.C.S., Epperston House, The Avenue Road, Leamington.

1899 YOUNG, Major L. Tarleton, M.D., Indian Medical Service.
1895 YOUNGER, Edward George, M.D., M.R.C.P., 19, Mecklenburgh Square, London, W.C.

NAMES OF TOWNS WHERE FELLOWS RESIDE.

The names of those Fellows marked with an asterisk (*) have not communicated their address.

ENGLAND.

ALTON.—Pechell, Major Sir A. A.

ASHBY-DE-LA-ZOUCH. — Williams, Chas. R.

ATTLEBOROUGH (Norfolk).
Oddin-Taylor, G. E.

BATH.
Bannatyne, Gilbert A.
Bayliss, R. A.
Begg, Chas.
Benson, John R.
Bowker, George.
Cowan, Frederick.
Ellis, W. McD.
Fraser, Forbes.
Kerr, J. G. Douglas.
King, Preston.
Lowe, T. Pagan.
Mackenzie, Alex. L.
Symons, W. H.
Walsh, Leslie H.
Weatherley, L. A.
Whitby, Chas.
Wigmore, J.

BEXHILL-ON-SEA.
Joseph, A. H.
Murdoch, Andrew.
Newell, Percy.
Wills, Joseph P. B.

BLACKPOOL.
Heaney, F. J. S.
Molloy, Leonard.

BOGNOR.—Rawlinson, Frederick J.

BOSCOMBE.
Thomas, A. W.
Hosker, J.

BOSTON SPA.—Selkirk, John.

BOURNEMOUTH.
Gardner, T. Fred.

BOURNEMOUTH.—*cont.*
Gardner, Wm. Thomas.
Greves, E. Hyla.
Harsant, Joseph George.
Lys, Henry Grabham.
Mahomed, A. G. S.
Muspratt, Chas. Drummond.
Scott, Thos. B.
Smyth, W. J.
Snow, William V. (Chairman of Council).

BRADFORD. — Campbell, Henry Johnston.

BRIDLINGTON.—Coleman, John J.

BRIGHTON.
Dodd, Walter H.
Griffin, Wm. Watson.
Hobhouse, Edmund.
Minter, Leonard J.
Noble, Stanley.

BRIXHAM.—Elliott, George B.

BURGESS HILL.—Furner, Willoughby.

BURNHAM. — Berry, Frederick Charles.

BURNLEY.—Mackenzie, James.

BURTON-ON-TRENT. — Johnston, W. A.

BUXTON.
Armstrong, Wm.
Bennett, Chas. J.
Braithwaite, John.
Buckley, Chas. W.
Flint, T. B.
Harburn, J. E.
Hartley, John.
Lorimer, George.
Thompson, G. H.

CAMBRIDGE. — Allbutt, Professor Clifford (Hon.).

CAISTOR-ON-SEA.—Case, William.

CHELTENHAM.
Cardew, G. A.
Forster, A. G. F.
Lawrence, H. Cripps.
Pruen, Septimus Tristram.
Symons, H. B. Trehane.

CLACTON-ON-SEA.—Nourse, C. M. Stuart.

CLIFTON.—Clarke, J. Michell.

DATCHET.—Drake, Thos. G.

DEAL.—Lyddon, Richard.

DEVONPORT.—Hall, O.

DROITWICH.
Corbett, Thomas.
Cuthbertson, J. M.
Foulds, Francis Henry.
Jones, H. Shirley.
Roden, Percy A.
Wilkinson, John.

EASTBOURNE.
Barnes, Robert.
Daly, W. J.
Frost, E.
Habgood, Henry.
Macqueen, Thomas.

EAST GRINSTEAD.—Hillyer, W. H.

EXETER.—Gordon, Wm.

FALMOUTH.
Bullmore, W. King.
Kneethsen, L. F. M.
*Young, Major L. Tarleton.

FARNHAM.
Oliver, George (Nov.-May).
Walters, F. Rufenacht.

FELIXSTOWE.—Havell, C. G.

FILEY.—Haworth, John T.

FINCHLEY.—Bangay, Richard.

FOLKESTONE.
Barrett, W. P.
Dodd, Percy.
Larking, Arthur E.
Lewis, Percy George.
Sworder, E. G.
Tyson, W. J.
Wainwright, Lennox.

GRANGE-OVER-SANDS. — Lowther, R.

GREAT YARMOUTH.—Moxon, A. H.

HARROGATE.
Bain, William.
Black, J. Gordon.
Gibson, Charles.
Hind, Harry.
Hobson, Lewis John.
Mouillot, F. A.
Myrtle, Andrew S.
Oliver, George (June-Oct.).
Ozanne, Frederick N.
Smith, Francis W.
Solly, Ernest.
Walker, A. W. Hinsley.
Watson, B.
Watson, W. Crawford.
Williams, Neville.

HASLEMERE.—Hutchinson, Roger Jackson.

HASTINGS.—Inglis, John.

HERNE BAY. — Bowes, Charles Keswick.

HODDESDON.—Love, William.

HOGSTHORPE.—Spilsbury, Francis James.

HYTHE (Kent).—Hackney, John.

ILFORD.—Houchin, E. K.

ILFRACOMBE.—Toller, C. W. E.

ILKLEY.
Bampton, A. H.
Bates, W. R.
Johnstone, Thomas.

KINGSBRIDGE (S. Devon).—Grey, Harry.

KING'S HEATH.—Dunkley, W. W.

LEAMINGTON.
Atkinson, Miles H. C.
Eardley-Wilmot, R.
Elrington, N.
Thursfield, Thos. W.
Wyer, Otho.

LEICESTER.
Dodd, John.
Pope, F. M.

LIFTON (Devon).—Musgrave, C. B. Thos.

LIVERPOOL. — Bickersteth, Edward Robert (Hon.).

LONDON.
Abraham, Phineas S.
Achard, Alexander (Marylebone, W.).
Allen, W. Hamilton (Stanmore).
Baynes, Donald.
Bidwell, Leonard.
Blaker, Walter C. M.
Brown, F. Gordon.
Bruce, J. Mitchell (Hon.).
Campbell, Harry (Hon. Treas.).
Cantlie, James.
Carpenter, Geo.
Cathcart, George C.
Chaldecott, John Henry (Hampstead, N.W.).
Clarke, Ernest.
Clippingdale, S. D. (Kensington).
Crook, H. Evelyn (Kensington).
Daniel, D. H.
Daniel, R. N. (S. Kensington).
Delbruck, R. E.
Dockrell, Morgan (Hon. Libr.).
Dodsworth, Frederick C. (Chiswick).
Dowse, Thos. Stretch.
Ewart, William.
Fayrer, Sir Joseph, Bart. (Hon.).
Felkin, Robert William.
Foster, Sir Walter (Hon.).
Fox, R. Fortescue (Winter).
Freyer, P. Johnston.
Gage-Brown, Charles Herbert (Belgravia, S.W.).
Gardner, J. Twiname (Chelsea).

LONDON.—*cont.*
Garrod, Sir Alfred (Hon.).
Goff, Bruce E. (Bayswater).
Harbord, Augustus (Bloomsbury, W.C.).
Hawthorne, C. O.
Hedley, W. S.
Hill, G. W.
Johnston, George F.
Jaffrey, Francis.
Jones, Montagu Handfield.
Keetley, C. R. B.
Kingsbury, Geo. C.
Kingscote, Ernest.
Knott, William (Fulham).
Lee, Robert (West Kensington).
Lewis, E. E.
Luff, Arthur Pearson.
Lyon, T. Glover (Victoria, S.W.).
McFarlane, Alexander R. (Chelsea, S.W.).
McCann, Frederick John.
McClure, Henry.
May, W. Page (May to Oct.).
Morison, Alexander.
Nightingale, P. A.
Orwin, Arthur W.
Poore, Vivian (Hon.).
Pope, H. Campbell (Shepherd's Bush, W.).
Pope, Percy.
Powell, Sir Richard Douglas, Bart. (Hon.).
Pritchard, Owen.
Rankin, Guthrie (Belgravia).
Roberts, Francis H. (Forest Hill, S.E.).
Roberts, Frederick T.
Sandwith, Fleming Mant (May-Dec.).
Sansom, Arthur.
Scott, John Walter (Tulse Hill, S.W.).
Shaw-Mackenzie, J. A.
Sikes, Arthur W.
Simpson, W. J. Ritchie.
Snape, Ernest.
Snell, Sidney H. (Wandsworth Common).
Spicer, Scanes.
Startin, James.

LONDON—*cont.*
Stephenson, Sydney.
Stiell, Gavin (Clapham Common, S.W.).
Stocker, W. Woodley (Willesden Green, N.W.).
Sunderland, Septimus (Hon. Sec.).
Thompson, H. E. Symes.
Thompson, E. Symes.
Thomson, H. Campbell.
Thomson, St. Clair.
Thorne-Thorne, Leslie.
Thorne, W. Bezly.
Tubby, A. H.
Underhill, T. H. (Herne Hill, S.E.)
Walker, H. Roe.
Walsh, David.
Ward-Humphreys, G. H.
Weber, Fred Parkes.
Weber, Sir Hermann (Hon.).
Wellesley-Garrett, A. S.
White, Charles Percival.
Wilkinson, P. J.
Williams, Charles Theodore (Hon.).
Williams, Chisholm.
Williams, Leonard.
Woods, J. F.
Yeo, I. Burney (Hon.).
Younger, Edward George (Bloomsbury, W.C.).

LOUTH.—Gresswell, Albert.

LOWESTOFT.
Forster, F. C.
Marshall, Augustine.

MABLETHORPE.—Iredale, J.

MALVERN.
Brockatt, Andrew A.
East, Charles Henry.
Fergusson, J. Campbell.
Holbeche, Arthur Oliver.

MALVERN LINK.—Weir, Archibald Munday.

MANCHESTER.—Roberts, D. Lloyd (Hon.).

MARGATE.
Brown, A. Warwick.
Hemming, J. J.
Thomson, Robert.
White, Edward Alexander.

MATLOCK.
Moxon, William.
Sharpe, William Cecil.

NANTWICH.—Munro, Seymour.

NEWQUAY.—Hardwick, Arthur.

OVERSTRAND.—Shaw-Mackenzie, A. C.

PAIGNTON.—Cosens, C. Hyde.

PARKSTONE.—Milner, Vincent.

PLYMOUTH.
Parsloe, Henry.
Pearse, William H.
Plant, James Robert.

POTTERS BAR.
Waddell, Arthur R.

RAMSGATE.
Berry, John Bourne.
Cross, G.

RICKMANSWORTH.—Branthwaite, R. Welsh.

RIPON.—Green, G. R.

SALTBURN-BY-THE-SEA.—Bennett, R. Allan.

SCARBOROUGH.
Leigh, John Dickinson.
Murray, G.
Symes, Ernest.

SEAFORD.—Morgan, William Pringle.

SHERINGHAM.—Sumpter, W. J. Ernley.

SIDMOUTH.
Bird, Arthur C.
Denne, de T. V.
Leon, George A.
Macindoe, Alexander.

SILLOTH.—Crerar, Charles.

SOUTHEND-ON-SEA.—Wade, C. H.

SOUTHPORT.—Pinkerton, Chas.

SOUTHSEA.—Leon, J. T.

SOUTHWOLD.—Herbert, Alf. Corbyn.

ST. ANNE'S-ON-SEA.—Merrall, H.

ST. IVES.—Nicholls, J. Michael.

ST. LEONARDS-ON-SEA.
Bagshawe, Frederic.
Batterham, John W.
Davis, W. H.
Inglis, Arthur Stephen.

ST. NEOTS.—Crosse, Edward J.

SURBITON (Surrey).—Merrick, Horace T.

SWINDON.—Swinhoe, George Rodway.

TICEHURST.—Newington, H. Hayes.

TORQUAY.
Crowdy, F. D.
Cumming, G. W. Hamilton.
Odell, William.
Pollard, Reginald.

TUNBRIDGE WELLS.
Bisshopp, F. R. B.
Forbes, Norman H.
Pardington, Geo. Lucas.
Ranking, John E.
Vise, C.
Watson, Chas. Robert.
Watson, Geo. T.

WESTGATE-ON-SEA.—Street, Alfred F.

WESTON-SUPER-MARE.
Aubrey, A. Reuben.
Martin, Ed. Fuller.
Rossiter, George F.

WEYMOUTH.—Lawrie, Macpherson J.

WHITBY.—Tinley, Wm. E.

WHITSTABLE.
Hayward, John W.

WIVENHOE.—Hewlett, W. H.

WOODHALL SPA.
Cuffe, Edward Meade.
Cuffe, Robert.
Williams, Cyril John.

WORTHING.—Simpson, W. S.

ISLE OF MAN.

DOUGLAS.—Mackenzie, Thomas.

RAMSEY.—Tellett, Frederick S.

ISLE OF WIGHT.

CARISBROOKE.—Groves, Joseph.

FRESHWATER.—Hollis, A.

NEWPORT.—Lowe, Geo. May.

SANDOWN.—Brodie, F. Carden.

TOTLAND BAY.—Hands, Chas. H.

WALES.

ABERYSTWITH.
Bonsall, G. R. E.
Thomas, Abraham.

BARMOUTH.—Lloyd, Hugh J.

BURRY PORT.—Williams, Owen.

FISHGUARD.—Owen, J. M.

LLANDRINDOD WELLS.
Davies, W. Bowen (President).
Evans, John Morgan.
Greenway, Alfred G.
Griffiths, J.
Macfie, Ronald Campbell.

LLANGAMMARCH WELLS.
Jones, Wm. Black.

LLANWRTYD WELLS.
Grant, J. W. G.

PENMAENMAWR.—Williams, John Robert.

PORT TALBOT.—Davies, J. H.

TENBY.
Knowling, E. M.
Reid, D.

SCOTLAND.

BRIDGE OF ALLAN.
Fraser, John Hosack.
Haldane, William.

CALLANDER.—McLaren, Hugh.

CRIEFF.—Thom, Alexander.

DUNKELD.—Taylor, James A.

EDINBURGH.
Affleck, Jas. O.
Brown, J. Murdoch.
Croom, Sir J. Halliday.
Daniel, G. W. B.
James, Alex.
Muirhead, Claude.
Russell, Wm.
Watson, D. Chalmers.

GLASGOW.—Alexander, John.

MOFFAT.—Huskie, David.

NAIRN.
Cruikshank, Brodie.
Sclanders, Alex.

OBAN.—McCalmen, Dove.

PITLOCHRY.—Beatty, S.

ROTHESAY.—Marshall, J. N.

STRATHPEFFER.
Bruce, William.
Duncan, E. H.
Fox, R. Fortescue (in Summer).

ST. ANDREWS.—Huntington, Wm.

IRELAND.

BELFAST.—Byers, Prof. John W. (Hon.).

BALLYSHANNON.—Creighton, Robt. H.

CORK.—Bennett, Arthur Geo.

DONEGAL.—Warnock, Hugh Thos.

DUBLIN.
Banks, Sir John (Hon.).
Little, James.
Merrick, Robert Warren.

KIRKCUBBIN.
McAulay, Matthew.

QUEENSTOWN.—Townsend, R. H.

VALENCIA ISLAND.—Letters, Patrick.

CHANNEL ISLANDS.

ALDERNEY.—Livesay, Edgar Wm.

JERSEY.
Bentlif, P. B.
Powell, O. E.

FELLOWS RESIDING ABROAD.

AIKEN (S. Carolina).—McGahan, Chas. F. (Corr.).

AIX-LES-BAINS.
Blanc, Leon (Hon.).
Forestier, Henri (Corr.).
Rendall, Stanley Morton (in Summer).

ASSOUAN (Egypt).
Canney, E. H. Leigh.
Edwards, Gerald Dundas.

BADEN-BADEN (Germany).
Gilbert, W. H. (Corr.).

BEX-LES-BAINS (Switzerland).
La Harpe, Eugene de (Corr.) (Summer).

CAIRO (Egypt).
Danvers, Herbert.
Sandwith, Fleming Mant.

CALEDON (S. Africa).—Parker, R. D.

CANNES.
Macdougall, J. Aymers.
Sanders, Gordon.

CAPE COLONY (Aliwal North).
Guillemard, B. J.

DURBAN (Natal).
Birtwell, Daniel.
Prince, J. Perrott.

FLORENCE.
Gordon, H. Laing.

GIBRALTAR.—Turner, William.

Helouan (Egypt).—May, Wm. Page (November to April).

Lausanne.—La Harpe, Eugene de (in Winter) (Corr.).

Luxor (Egypt).—Rountree, Geo. Atkins.

Madeira. — Krohn, Ronald Edward Stewart.

Mentone.
Campbell, J. William.
Rendall, Stanley Morton (in Winter).

Milan.—Eyre, John J. (April to November).

Monte Carlo.
Barnard, John Henry.
Fagge, T. H.
Mitchell, R. Pryce.
Rouse, Rolla.
Sim, Roderick.

Montreux (Switzerland).—Wise, Alfred Thos. Tucker.

Naples (Italy).
Gairdner, Matthew Wm.
Symons, H. B. T.

Neuenahr (Germany).—Grübe, Karl (Corr.).

Nice (France).
Amy, George.
Gilchrist, Alexander Wm.

Oudtshoorn (South Africa).
Russell, George.

Philadelphia. — Hinsdale, Guy (Corr.).

Pyrmont (Germany). — Marcus, Tigismund (in Summer) (Corr.).

Rome.—Eyre, John J. (December to March).

Rotorua (New Zealand).
Wohlmann, A.

San Remo (Italy).
Foster, Geo. Michael.
Marcus, Tigismund (in Winter) (Corr.)

St. Moritz (Switzerland).
Holland, James Frank.

Vichy and Hyères.—Cormack, Charles E.

Victoria (Australia). — Naylor, Rupert Geo.

INDEX.

A

B

C

D

H

I

J

K

L

T